SCIENTIFIC AMERICAN

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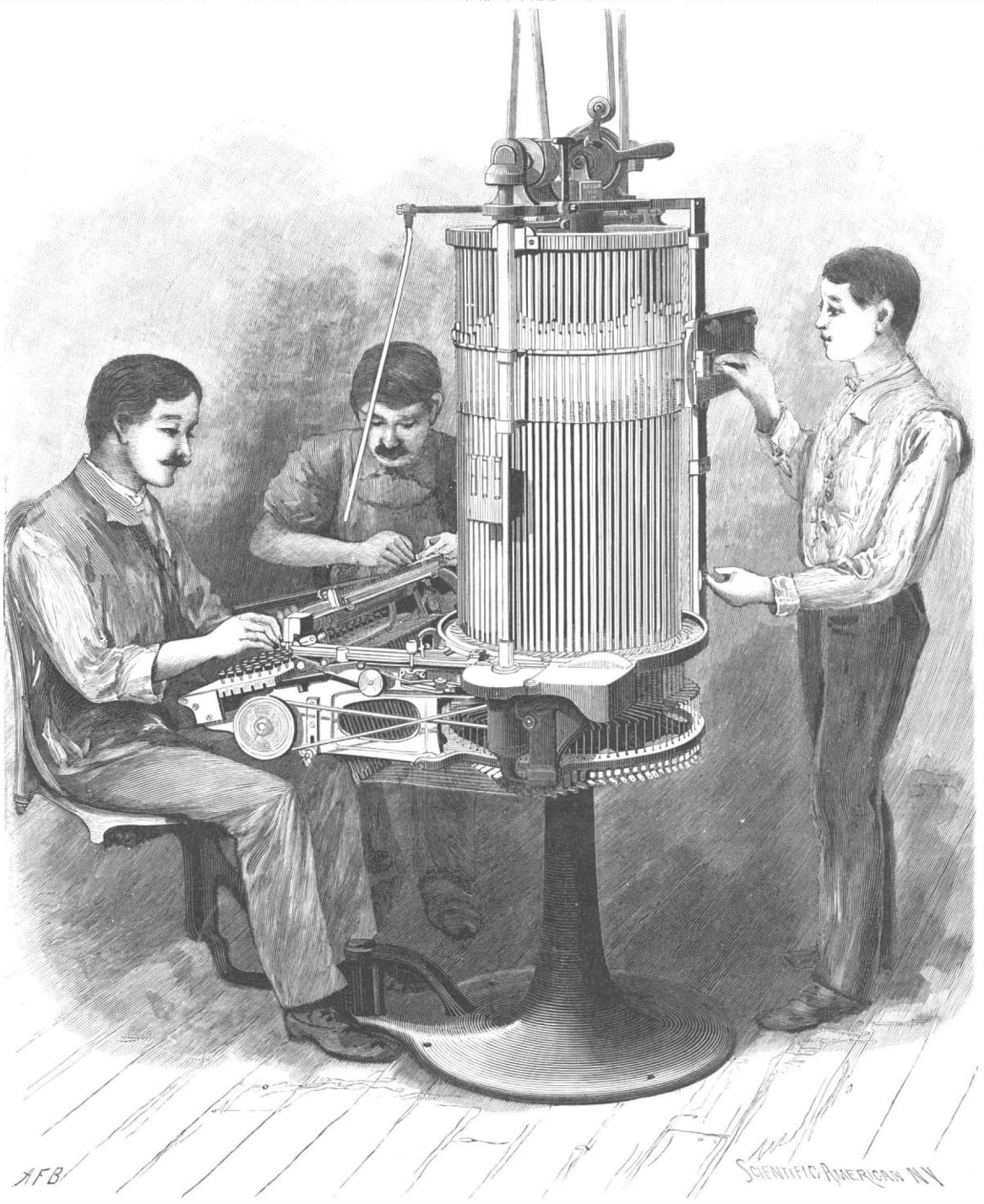
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXXIII.—No. 8. [ESTABLISHED 1845.] NEW YORK, AUGUST 24, 1895 [$3.00 A YEAR. WEEKLY.

THE THORNE TYPESETTING MACHINE.

There are in the United States 2,000 daily and nearly 15,000 weekly newspapers, with some three thousand other regular publications, such as monthlies, quarterlies, etc. Besides these stated issues of printed matter, nearly all of our large cities have one or more publishing houses where books are produced, there being but few towns or villages so small as not to include those finding a livelihood at the printer's occupation. We are emphatically a nation of readers.

The first step in printing, setting up the type, is slow and tedious work. There are but few printers sufficiently expert to set up in a day enough type to form a page of the SCIENTIFIC AMERICAN. Hence inventors have labored for many years to perfect machines to do this work, and, by their perseverance, skill and ingenuity, have at last attained a degree of success which is having a very marked influence in the printing business. We have heretofore illustrated and described different machines of this character, and in the accompanying illustrations show the construction and operation of a typesetting machine which has been steadily growing in favor for the last eight years, which is now in daily use in some of our largest and best appointed printing offices, and which has points of superiority that strongly commend it to the trade.

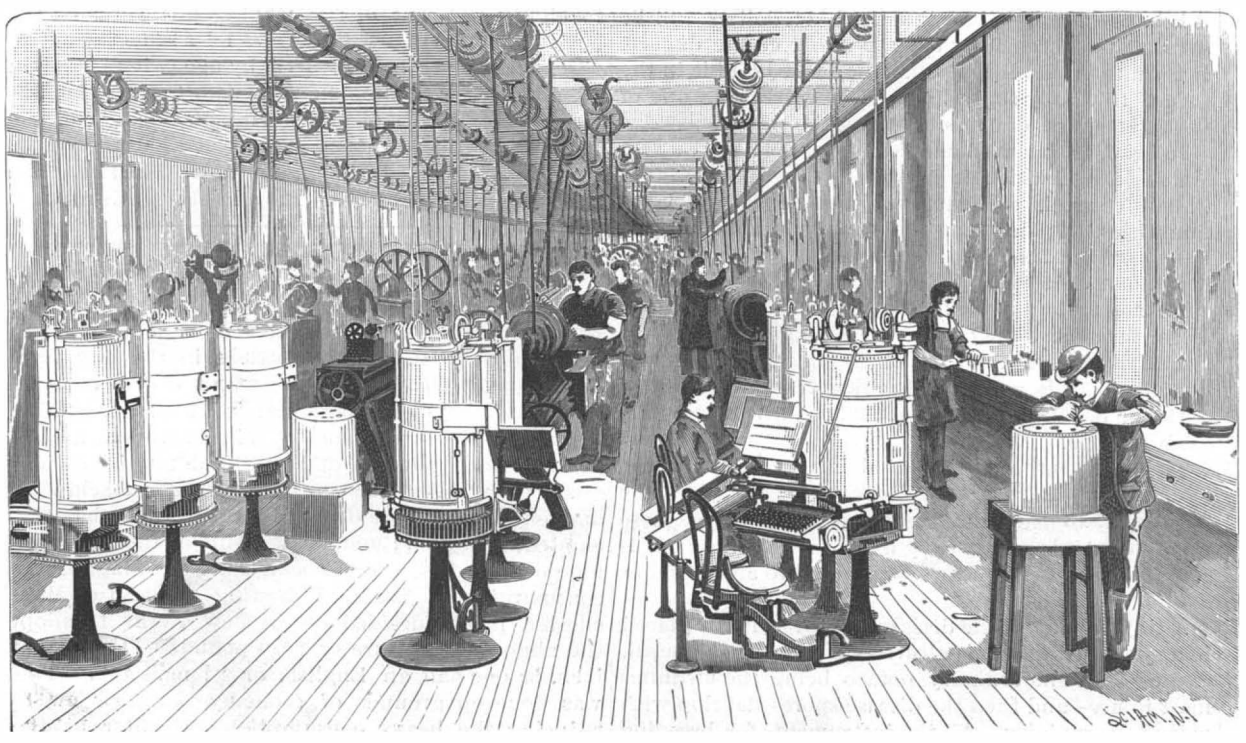


THE THORNE MACHINE IN OPERATION.

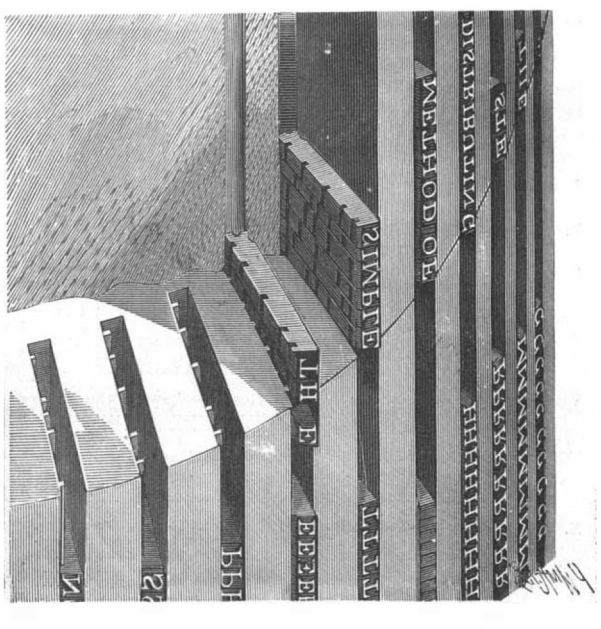
The Thorne typesetting machine sets up the type furnished by the type foundry, composing the line of individual letters and characters, for the press or for the making of plates, as would be done by hand, but does not cast type lines. It requires one operator to manipulate the keyboard, one to justify the lines, and a boy to attend to the distributing cylinder, the latter being work not requiring special skill. The amount of work done on the machine of course varies with the expertness of the operators, but an average of over 7,000 ems per hour, for all the working hours of one month, working seven and eight hours a day, is given as the performance of one machine in the composing room of a prominent New York newspaper. This is only an average, however, in the regular work of the establishment, where five of the machines are now employed. Composition at the rate of 9,000 ems per hour has been accomplished.

The mechanism of the machine is simple, consisting primarily of two vertical cylinders sixteen inches in diameter, placed one above the other on the same axis. In the surface of these cylinders are cut ninety vertical channels extending the entire length of each cylinder, in depth nearly equal to the length of a type, and corresponding in width to the body of the type to be used. The upper cylinder, which revolves, forms the distributer, and into its channels is loaded type, face out, from a special galley. This operation is very simple and rapid, less than five minutes being required to

(Continued on page 118.)



THE THORNE MACHINE—ASSEMBLING THE PARTS.



DISTRIBUTING TYPE.

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Scientific American.

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NEW YORK, SATURDAY, AUGUST 24, 1895.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 1025.

For the Week Ending August 24, 1895.

Price 10 cents. For sale by all newsdealers.

THE UNITED STATES CRUISER COLUMBIA.

We recorded recently the rapid voyage of our new war steamer the Columbia, from Southampton to New York, the object being to ascertain the reliability and fastest speed the ship is capable of on an ocean voyage. The time made was seven days, less eleven minutes. This comes within a few hours of being as quick a passage as the best of the regular American liners in the merchant service, and is probably the fastest speed ever made by a war vessel of any class on a continuous voyage of the same length, about 3,000 miles.

We infer, however, from the official report of Capt. Sumner, that the Columbia had a narrow escape from breaking down in her boilers, and probably another similar effort would use her up altogether.

The report says: With a smooth sea in the English Channel the ship made 18 to 19 knots an hour. With all the hatches on the forecastle down, considerable water came on board. The maximum roll was nineteen to port and seventeen to starboard. The ship was steaming 17 to 19 knots an hour on an allowance of 200 tons a day. At 12:10 A. M., July 27, a tube blew out in No. 6 connection of boiler F, and the boiler was put out of use for seven hours.

Wednesday.—Fair weather for the most part, sea smooth and moderate. Leaky tube in top row, middle box No. 6 fire room, boiler E. It was plugged with wooden plug. Steam was sent through auxiliary main pipes. Other plugs were placed in leaky tubes. The vacuum was poor and getting poorer, and the main condensers appeared to be greasy.

In closing his report Capt. Sumner says: "It was not deemed practicable to make the last twenty-four hours run under forced draught, because of the unreliability of the boilers (we were blowing out tubes at 140 pounds pressure), the loose state of the engines from the long run, the great fatigue of the crew, and above all the impracticability of getting a coal supply to the boilers with sufficient rapidity, as the coal was located at this stage of the run. The run involved excessive labor on the part of most of the ship's company. There were twelve volunteers from deck on duty in the fire rooms for the whole run, and forty-eight more men from deck have been employed below for some days in supplying the lower bunkers with coal from the wing passages."

She had on board on starting from Southampton, 1,862 tons, of which she consumed 1,474 tons, leaving 328 tons on board when port was reached.

CHINCH BUG EXTERMINATION.

One of the destructive pests of the West is the chinch bug, which, in certain years, does immense damage to the crops all over the grain regions. It was learned some time ago that there was a fungous growth, or disease, a white, powdery, dust-like substance, considerably like many of the fungous growths which visit plants, which, when applied to the chinch bugs, killed them.

At the State Experiment Station connected with the State University of Minnesota some very interesting experiments are being conducted, under the direction of Prof. Otto Lugger, of the chair of entomology of the station, in spreading this disease among the healthy bugs of the farms of Minnesota. The results attained are, so far, very satisfactory, and it is probable, from what has already been accomplished, that in the future the farmers will be able to very largely control the pest, and, it may be, totally eradicate it.

In any event, the investigations are proving that there is an important economic side to the work, and it is but fair to say that thousands of dollars will be saved to the farmers by the spreading of the disease. It is quite probable, too, that they will be able in the future to wholly control this, in some seasons, one of the most serious dangers besetting the crops.

In brief, the method employed is as follows:

The disease, which is known as the Sporotrichum globuliferum, is cultivated at the station in large quantities. It develops rapidly and the capacity of the plant, so to call it, of the station is about one hundred quarts per week. The disease is put up in small tin boxes, an inch or so in diameter, and then shipped to the farmers. The farmers collect a large number of healthy bugs, put them in low, damp wooden boxes in which wheat is growing, sprinkle the bugs liberally with the powder, and then set them adrift among the healthy bugs.

The result is that the diseased bugs convey the disease to the healthy ones, and, as one bug may convey the disease to many hundreds and each one of these many hundreds may convey it to other hundreds, it is not long before the disease is spread to an enormous extent.

A tiny portion of the disease, to start with, is placed in a good medium for culture—agar-agar, corn meal, and beef tea and ordinary potato being the mediums most in use—and then the disease spores develop with marvelous rapidity. All the instruments for breeding the disease are of the most improved pattern and the sterilizing outfit is complete.

It has been known for several years that this disease was a deadly foe to the chinch bugs. This practical application of the knowledge is a distinct and important step forward in the way of utilizing interesting and thoroughly scientific information for the economic advantage of the farmers of a vast region of country. Complete ultimate success seems assured, and the several thousands of dollars appropriated by the Minnesota State Legislature last winter for the carrying on of Prof. Lugger's experiments seem to have been well invested. Mr. R. H. Pettit, recently of Cornell University, New York, is assisting Prof. Lugger in the work.

A. S. H.

ELECTRICAL ITEMS WORTH REPEATING.

The conductivity of metals decreases and that of some bad conductors or insulators increases with the temperature.

A current of one ampere, flowing through a resistance of one ohm, develops therein 0·24 heat unit per second.

Printers' roll composition makes an excellent flexible mould, but in electrotyping it can safely be used only in a saturated plating solution.

A horseshoe magnet will lift a load three or four times as great as a bar magnet of the same weight will lift.

One legal ohm equals 1·0112 British Association units; hence, to transform resistances expressed in British Association units to legal ohms, the numerical values have to be reduced by about one-tenth per cent.

Plumbago brushed over the face of a medal or other metallic object—an electrotype copy of which is desired in intaglio—will prevent the copper or other metal electrically deposited from adhering.

In winding an armature, if it is found a coil has been wound in the wrong direction, it is unnecessary to unwind it. It is just as well to reverse the connections with the commutator.

Field magnet cores, for ring machines, should be 1·66 times the diameter of the armature core, if of wrought iron, or 3 times if of cast iron. For drum machines the figures are 1·25 and 2·3.

In designing a dynamo, the field magnet should be as strong as possible. An increase in the strength of the field increases the induction and the electro-motive force, or what amounts to the same thing, permits of decreasing the length of the armature for a given voltage.

Gutta percha heated in hot water at about 100° F. becomes plastic, and will take a fine impression with slight pressure. When gutta percha is soaked for a few hours in benzole or naphtha, it becomes swollen, and if it is then dipped in hot water, it becomes so plastic that it may be used with safety on very fragile and delicate objects. Specially adapted to electrotyping.

In two pole dynamos the proportions of ring armatures vary from a length equal to one-half the diameter to a length equal to one and one-half diameters. It is common to make the length equal to the diameter. For drum armatures the length sometimes equals one and one-half diameters and sometimes three diameters. It is common to find the length equal to two diameters.

According to Hering, with a suitable field magnet, every foot of active wire on the armature of a dynamo will generate about 1·2 volts, when the velocity of the wire is about forty feet per second. As the wire which lies in the neutral part of the field is twenty to twenty-five per cent of the whole amount of wire on the cylindrical surface, the active part is seventy-five to eighty per cent of the whole. For 110 volts the length of active wire will be $110 \div 1{\cdot}2 = 92$ feet of active wire, which must be embraced by one pole piece. On account of the winding being in two halves, in multiple arc, the length of active wire on one-half of the armature surface will be $92 \div 0{\cdot}75 = 123$, the whole length of active wire being 246 feet. The size of the wire will be determined by the allowable resistance.

A REMARKABLE HYDRAULIC POWER SUPPLY.

There has recently been inaugurated at the city of Glasgow a system of hydraulic supply works that possesses features of special interest. For many years the hydraulic hoists and presses in the city have derived their power from the mains of the common city water supply, which carried a pressure of 50 pounds to the square inch. While this was a good pressure for ordinary domestic and municipal purposes, it was a low pressure for hydraulic machinery, and entailed the use of large diameter cylinders and cumbersome plant; and, as a result of the large volume of cylinders, there was a correspondingly large consumption of water. Following the lead of Manchester, it was decided in the new works to adopt the abnormal pressure of 1,120 pounds to the square inch, or one half an English, or "long," ton. This was done on grounds of economy, with a view to reducing the heavy consumption of water at the lower pressure. Water at 1,120 pounds pressure has 22 times the efficiency of water at 50 pounds pressure; and to effect a certain unit of work there will be re-

quired only 1-22 as much water at the higher pressure. Against this is to be reckoned the cost and operation of the powerful pumping engines, accumulators, etc., and the massive piping and plant, that is rendered necessary by the enormous pressure they develop; and also the extra care and more costly maintenance thereby involved. These latter items, however, are relatively insignificant compared with the vast saving of water. This is shown by the figures of Mr. Gale, the water engineer of the city, who estimates that a customer whose bill is at present $350 will receive the same power for $200 under the new system.

It would appear that this system of hydraulic supply from a central station has long passed out of the experimental stage. The first experiments in this direction were carried out in Dublin, Ireland, in 1802. The development, by Sir William Armstrong, of the hydraulic press led to the laying down of works at Hull; and in 1882 to 1884 a large system was established in London, where it has proved a great benefit to the public and a complete financial success. There are in London 75 miles of mains, carrying a pressure of 750 pounds. This operates no less than 2,300 machines, and yields a revenue of $250,000.

The plant of the Glasgow works is housed in substantial stone buildings, on the top of one of which is a large iron tank of 200,000 gallons capacity. It consists of four large Lancashire boilers, three sets of pumping engines of 200 horse power each, and two accumulators. Each engine will pump 230 gallons per minute against the accumulator pressure of 1,120 pounds. The accumulators have rams of 18 inches diameter and 23 feet stroke.

The engines deliver into 7 inch main pipes, which have branch 6 inch and 5 inch pipes serving the main streets.

Compared with other systems of power supply from a central station, this is probably the least known. Steam power, pneumatic power and electricity have all been tested on a large scale, the pneumatic system in Paris and the other two in many places and on varying scales. As compared with steam or electricity, hydraulic power has the decided advantage that there is very little loss in transmission. The most careful methods fail to prevent a considerable condensation in the piping of the steam supply, whereas the hydraulic system, when worked at such a high pressure, must show an almost inappreciable loss of head by friction in the pipes. As a result of the small volume of water necessary for work at such high pressure, the flow in the pipes would be proportionately slow and the friction light.

There is no danger from rupture of pipes and escape of steam; and owing to the great thickness of the piping, its useful life will be proportionately long.

Compared with the electric supply system, the superiority of the hydraulic system is open to question. It is freer from risk to the consumer, both in person and in property, and there is less loss in transmission; but the great facilities for transmission afforded by the use of electricity far outweigh the risk from fire that at present attaches to electrical wiring.

The relative difficulties and expense attached to the distribution of power through a building by heavy and massive piping, or by electric wiring, are vastly in favor of the latter.

There is one feature of a hydraulic supply system that should be mentioned as giving it special value, from a municipal standpoint, and that is that it furnishes a powerful supply for fire purposes. Water at one-half ton to the square inch, on tap at any point in the streets of a city, constitutes a powerful fire protection. Such water could be thrown to great heights and distances, and, as any one who has watched the hydraulic mining of the West can understand, it would tear its way quickly through walls and partitions, to reach concealed fires, more rapidly than any opening could be made for it by the firemen themselves.

It is intended to utilize the Glasgow supply for fire extinction. At the recent inauguration of the works, couplings were made and a powerful stream was thrown to unprecedented heights and distances. The tests were made in the presence of Sir William Arrol, the contractor for the Forth Bridge, and many eminent engineers, and was considered highly satisfactory.

Atlanta Exposition Notes.

The Chief of the Department of Public Comfort has arranged with the Pullman Sleeping Car Company for three hundred sleeping cars to be parked on the railroad sidings in and near Atlanta. These sleeping cars will accommodate between 7,000 and 8,000 people and the berths will be rented for $1 per night. The listing of rooms by the public comfort department has been very satisfactory and includes apartments in some of the handsomest residences in the city.

The gates of the Exposition have been closed and a twenty-five cent admission is charged to keep off the crowd during the period of installation.

One of the interesting features of the Exposition will be the Phœnix Wheel, which will be 125 feet in diameter and will be placed upon the highest part of the midway, 65 feet above the lake level, thus carrying passengers nearly 200 feet above the general elevation of the lake and plaza and giving a commanding view of all the buildings, the grounds and the surrounding country. The wheel will be lighted by electricity at night; its capacity will be about 250 people at each revolution.

Mrs. W. D. Grant has secured from the Commissioner of Patents an exhibition of inventions of women. This will include about 125 models. It will be the first exhibit of women's inventions ever made at an American exposition. It will be separate and distinct from the general exhibits of patents, which Mr. Seymour will make in the United States Government building.

Mrs. Mary S. Lockwood has consented to deliver a lecture on "The Inventions of Women" on October 21.

The Department of Colonial Relics will be one of the most interesting departments of the Exposition.

The Art Department promises to be one of the best features of the Exposition. Mr. Horace Bradley, chief of the department, has returned from Europe with a long list of works of artists of distinction. Many of the leading artists of America will contribute works of art. The work of picture hanging was begun August 10.

Cycle Notes.

A new contrivance has been invented to spot the bicycle thief. A steel spring runs down the rear post of the frame connecting with the small sprocket wheel; a key turns this spring, so that when the wheel is in motion the sprocket wheel hits against it, making a clicking noise which can be heard a long distance. When the owner wishes to ride, the key is turned back and the spring falls against the inner wall of the post.

The "Ki-Yi," or cycle tourist's gun, is a very effective weapon against dogs which delight in worrying cyclers. A few drops of diluted aqua ammonia from the nozzle of the Ki-Yi gun will soon give the bicycle-chasing dog a lesson he will not be likely soon to forget. A small clip upon the nozzle prevents the escape of the ammonia.

The general superintendent of the New York State Reformatory writes us: "The captain of the watch at this reformatory makes his rounds within the prison proper through the main corridors, a distance of about one-half mile, on a bicycle, and we find it a very happy suggestion. His trips are swift and noiseless and he is thus able to detect any duty defect on the part of the under watchmen."

M. Reviere covered 523 miles and 10·29 yards in twenty-four hours on the Humber bicycle.

When inflating a tire should the rod rebound from the air pump, the air valve in the tire to which the pump is attached should be examined, as there is probably a leak somewhere and to continue pumping up the tire is only labor lost.

It seems pretty well agreed that next year tires will be larger than those now in use, more tires will be built 1⅝ and 1¾ inches in diameter. It is probable that the bicycles will have larger tubing.

A convenient way of tightening the chain is to unscrew the nuts on the rear hub, to allow free moving of the rear upper brace, then pull the wheel out until the chain is to the desired tightness, then re-tighten the nuts on the rear hub.

A curious bicycle has been invented by a resident of New York City. The pedals, instead of acting on the wheel by means of a chain and sprocket wheel, are practically pump handles and force water to a water wheel attached to the rear wheel of the cycle.

It is stated that the factories which are devoted to bicycle manufacturing in the United States now have a capacity of 560,000 bicycles per annum. Many of the factories have more than doubled the size of their plants within a few months. It is said that the cost of producing a first-class bicycle varies from $25 to $35.

There is a bicycle which is being introduced in England for elderly persons which is called a "bantam." It has very low wheels.

The latest thing for the army is a cannon mounted on a twin bicycle. The cannon itself is a steel rifled affair 34 inches in length, and weighs about 50 pounds, and is swung between the rear wheels, resting upon the connecting axle, and is further supported from above. The caisson containing the ammunition is carried on another duplex. Four artillerymen equip a battery. They furnish at once the gun crew and motive power.

It is reported that a septuplette wheel, which is 15 feet 6 inches in length, is now being made in Europe, and will shortly be shipped to this country. Its principal use will be for pacing.

Beware of a clicking sound in your machine. The chances are that it is caused by the balls in a loose bearing, and this demands immediate remedy.

A new record for Great Britain was made at Putney, England, on June 26, by Mr. Barden, who made a mile in 1:50⅘.

A lamplighter of Elizabeth, N. J., does his work upon the wheel with the aid of a torch, without dismounting. It is a curious fact that one of his legs is an artificial one.

The Paris Figaro announces that the Emperor of Germany has taken to cycling, and is having a track built in the neighborhood of Berlin, to which, however, only members of the imperial family and their guests will have admittance.

In some places it is proposed to tax bicycles to add to the revenues of the county, and the only reason why they are not taxed is that the board of supervisors or other officers do not care to antagonize the large number of wheelmen who are among their constituents. The reasons advanced for the proposed innovation are that the extensive use of wheels has cut down the business of liverymen and kindred lines, thereby reducing the taxable property to an extent which should be made up by the wheelmen.

It is said that bicycles have seriously injured the sale of pianos in England.

DECISIONS RELATING TO PATENTS.

United States Circuit Court of Appeals—First Circuit.

WRIGHT & COLTON WIRE CLOTH COMPANY VS. CLINTON WIRE CLOTH COMPANY.

Appeal from the Circuit Court of the United States for the District of Massachusetts.

Decided May 10, 1895.

Aldrich, J.:

Art of Weaving Wire Cloth.—The claim of letters patent No. 239,012, granted March 15, 1881, to G. F. Wright, for art of weaving wire cloth, should not, if sustained, be construed so broadly as to give a monopoly of all the means for straightening or swaging wire in the wire weaving industry.

Letters patent No. 239,011, granted March 15, 1881, to G. F. Wright, for a shuttle for weaving wire cloth, if it presents a patentable device, does not cover all means of swaging turns of twist into wire, and the defendant's device covered by letters patent No. 299,895, granted June 3, 1884, to G. F. Wright, for a shuttle for weaving wire cloth, in which old and well known means are employed, does not infringe.

Under the doctrine that the patentee is entitled to all known and unknown uses to which his invention may be applied, the public is entitled to all uses of devices covered in expired patents, and the discoverer that old means will do a new work is not entitled to a monopoly.

If patentable at all, a combination of old means with improvements adapting it to new and non-analogous material and use, a patent will be limited to the combination modified by the improvements.

Photography in Musical Research.

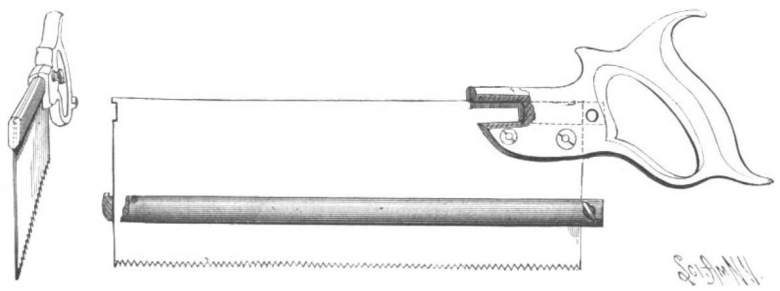
The motion of a pianoforte wire when struck has been recently investigated by Kaufmann, whose paper on the subject is accompanied by a set of interesting photographic records. By vibrating the wire in front of a luminous slit and throwing the image of it upon very sensitive paper rotating upon a cylinder, a white line is traced upon a black ground. This line, which is due to the interruption of the luminous slit by the opaque wire, exhibits all the motions of the particular point in the wire which is crossed by the slit. In order to bring the plane of the slit into exact coincidence with the wire, an image of the slit, produced by a lens with the aid of the electric arc, was thrown upon the wire itself. Since the hammer struck the point photographed, the motion of the wire was traced from the very first, the commencement of the vibration being the most interesting stage. Hard and soft hammers were tried, the latter corresponding to those actually used in the piano. It was found that the duration of contact is longer with feeble than with hard striking. As the force increases, the duration of contact rapidly approaches a limiting value equal to that of a hard hammer of equal weight. But the practically most important result was the proof that when a wire is struck at a point between one-seventh and one-ninth of its length, the fundamental tone has a maximum, and the harmonics are very feeble. Hence a wire thus struck gives its strongest and richest tone.—The Optician.

A Pin Machine.

Among the operative exhibits that will be shown in Machinery Hall at the Cotton States and International Exposition is a pin machine. It is in two parts, the first of which makes pins and the second sticks them in paper. This will be done in full view of the visitors. A slender thread of brass wire is started in one end of the machine. It is cut, pointed and the head put on, and the completed pin is dropped into a bath which plates it with white metal. From this receptacle the pins are dropped into a sifter, which carries them rapidly to the sticking machine, where they are stuck in regular rows in the paper, and a complete paper of pins is turned out. The mechanism of the machinery is delicately elaborate, and it will be one of the most interesting exhibits in the Machinery Hall.

AN IMPROVED SAW.

According to the improvement represented in the illustration, the saw blade can be readily gaged to permit the operator to cut to a desired depth. A patent has been granted for the invention to Henry J. Edlund, of the Kings County Hospital, Kingston Avenue, Flatbush, Brooklyn, N. Y. The saw back is detachable, and is made U-shaped to fit both sides of the blade, the middle portion being formed with a projection adapted to engage a notch on the outer end of the blade, to hold the back in position when used as a back. The free ends of the back portion extend through recesses in the handle and are fastened in place by a thumb screw, the two ends of the back being also similarly connected with each other at the rear of the saw blade when the back is used as a gage, as shown in the illustration.



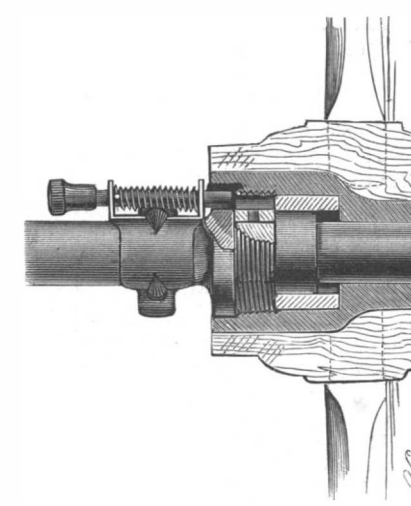
EDLUND'S HAND SAW.

Mining Near the Equator.

W. H. Adams, of Grass Valley, has a letter from his brother, Jas. B. Adams, who with three or four companions are working for the Playa de Ora Mining Company, in Ecuador, S. A., 200 miles back from the sea coast. The mine is three degrees from the equator, and they suffer the discomforts of heat, tornadoes and insect pests. At times the rainfall reaches ten inches in an hour, the streams rising twenty feet within a short space of time. The insects are prodigious in size and continuous in their operations. Vampire bats stealthily alight upon a person in deep slumber, inserting their beaks and gorge themselves with his life blood. There is also miasma in the atmosphere, and fever prevails. Nothing but liberal salaries could tempt civilized people to remain under all these discomforting conditions. The mining operations are superintended by educated and experienced white men, while the heavy manual labor is done by the natives at very low wages. Besides Mr. Adams, Edwin Ryan of North Bloomfield is foreman at the Playa de Ora. Wm. Davis of Nevada City is located at another mine, three miles distant. Mr. Blodgett, a former foreman of the mine, is on the way home to Nevada City. Five miners from Sierra County have lately arrived in the same country. The ore taken from the Playa de Ora is very rich and pays the owners large dividends.—Min. and Sci. Press.

A HUB ATTACHING DEVICE.

The illustration represents improved means for holding a vehicle wheel to the axle, preventing dust from passing to the spindle. The improvement has been patented by Hartwell T. Lewis, of Calumet, Mich. The socket of the wheel hub has at its inner end an enlarged portion with an internal screw thread, in which screws a nut turning loosely between collars on the axle spindle. The nut has a longitudinal recess adapted to be engaged by the inner end of a pin sliding in bearings on the clip connecting the wooden portion of the axle with the metallic part. The pin is normally spring-pressed to hold it out of engagement with the nut, when the latter revolves freely around the axle, but on the outer end of the pin is a knob, and on pushing the pin inwardly its inner end engages the recess in the nut, preventing it from turning on the axle spindle, and allowing the hub to be thus unscrewed from the nut whenever it is desired to remove the wheel. A bushing jams against the outer end of the loose nut, and against its inner end fits a flange of the axle, the outer end of the hub being closed, preventing the passage of dust and other impurities to the bearing. It will thus be seen that the wheel may be readily removed from the axle, to lubricate or for repairs, without the use of a wrench or other tools.



LEWIS' HUB ATTACHING DEVICE.

The Frozen Milk Industry.

Canada's representative in Denmark reports that during the past year a new industry has been established there which promises to prove both profitable and serviceable, and which might be followed with equal success on this side of the water, viz., the shipment of frozen milk to large cities. A year ago a Danish merchant experimented in this direction by taking Danish milk, which is peculiarly delicate and rich in flavor, freezing it by the use of ice and salt, and sending it in barrels by rail and steamer to London. On its arrival the milk proved to be as sweet and well tasting as if it had been just drawn from a cow in the middle of Sweden. The milk was so much in demand and proved so profitable an article of commerce that the exporter immediately took out a patent on the shipment of frozen milk from Sweden and Denmark to London. He then sold the patent to a stock company with large capital, which, on February 1 last, bought one of the largest Swedish creameries, converted it into a factory, and, having put in a special freezing apparatus, began, on May 1, the export of frozen milk in large quantities.

When the milk is received from the farmers it is pasteurized, that is, heated to 75° C., and then immediately cooled off to about 10° C., and now the freezing is commenced. Half the milk is filled into cans and placed in a freezing apparatus, where it will be thoroughly frozen in the course of three hours. The frozen milk is then filled into barrels of pine, the only kind of wood that can be used. The barrels, however, are only half filled with this frozen milk, the balance being filled with the unfrozen milk. This way of packing has proved to be the only practical one, as part of the milk has to be frozen in order to keep the whole cold, and part has to be in a flowing state in order to get the barrels exactly full, which is necessary in order to avoid too much shaking up on the road, by which the cream would be turned into butter; the floating masses of ice at the same time prevent the unfrozen milk settling in the cream. Milk which is treated in this way has proved to keep quite fresh for twenty-six days. Every barrel holds 1,000 pounds of milk, and twice a week there will be shipped fifty barrels, making in all about 100,000 pounds of milk a week.

The milk is shipped to Newcastle, and from there by rail to large manufacturing cities, where it is sold in the streets or in retail stores. It is reported that the patent has been bought for Ireland also at a cost of $200,000, which proves how much the stock company expects from this new enterprise.

The time may not be far away when the dairy farms of the New England and Western States may be sending, not butter and milk, but frozen milk and cream, to the large cities of both continents.—Phil. Record.

Solid Carbonic Acid.

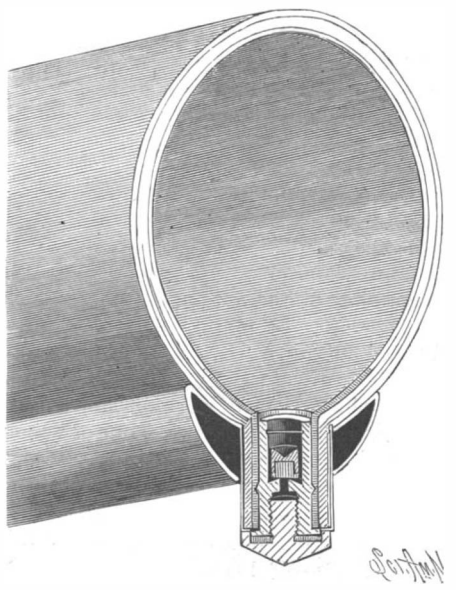
Dry carbonic acid was distilled and solidified in a wide refrigerated tube in which a thermometer had been introduced axially. The melting point of the solid acid was —56·7°. The pressure at the time was 5·1 atmospheres. The point of refrigeration was then observed and found to be —56·7° at the pressure of 5·1 atmospheres. This result agrees substantially with the figures found by Faraday. The point of ebullition of solid carbonic acid is at —79°. Regnault found —78·16 and Pouillet —79°. Ether mixed with solidified carbonic acid (carbonic snow) does not reduce the temperature. Methyl chloride behaves quite differently. Setting out from —65°, the carbonic snow dissolves without liberation of gas, and at the moment of complete saturation the thermometer marks —85°. The lowest temperature reached by means of carbonic snow in vacuo is —115°, a point which was maintained for nearly three hours.—P. Villard and R. Jarry.

Fast Locomotive.

The Baldwin Locomotive Works are building a 19 by 26 inch passenger engine for the C., B. & Q., to carry 200 pounds steam pressure and have piston valves, and a trailing truck behind the drivers. It will be a simple engine and is for the purpose of hauling a train of six cars from Chicago to Galesburg, 163 miles, in three hours, or at an average speed of 54·3 miles per hour. The grate area is to be large and the locomotive will be very powerful. This engine is the outcome of the competition between the Burlington and the Northwestern in mail and fast passenger service.

A PNEUMATIC TIRE INFLATING VALVE.

The illustration represents a simple and inexpensive valve for the inflation of pneumatic tires, one which protrudes but little from the wheel rim, is easily secured in place, is airtight and dustproof, and not liable to get out of order. It has been patented by Frank Gustaveson, of Wabasha, Minn. A metal sleeve extending through the rim incloses a rubber and canvas sleeve extending into the tire, and in this sleeve is fitted the valve casing, made with an external flange embedded in the interior sleeve. Centrally in the valve casing is an air passage and valve seat, the valve being preferably faced with rubber or similar material, and the air passing around the valve, when it is removed from its seat, to the interior of the tire. A wire across the inner end of the valve casing prevents the valve from falling out of its chamber. A cap screws into the outer end of the valve casing, a rubber washer forming an airtight closure, and to inflate the tire this cap is removed and an ordinary air pump is applied. The air forced in by the pump moves the valve from its seat and passes into the tire, the back pressure closing the valve when the pump is removed.



GUSTAVESON'S PNEUMATIC TIRE VALVE.

The Siberian Railway.

The Trans-Baikal section of the Siberian Railway is now completed. The original plans for this line were abandoned, owing to the fact that they would have necessitated the carrying of the line to an elevation of 3,000 feet above the sea, through arid districts where but few settlers could make a livelihood. A more southern route has now been adopted, which, though considerably longer, will run by four of the principal rivers, through regions rich in salt, soda, silver, copper, iron, lead and gold, and in which many mines have been opened. Some 750 miles of the Siberian Railway are open for traffic, viz., Chelabinsk to Omsk in the west, 500 miles; and Vladivostock to Grafskaja in the east, 250 miles. Thus Omsk is placed in direct communication with Moscow and St. Petersburg. Of the total length of 6,000 miles from St. Petersburg to Vladivostock, about 3,700 miles have still to be completed.

AN IMPROVED TUBE CLEANER.

The self-expanding boiler tube scraper shown in the accompanying illustration is easily operated and of approved efficiency. It has been patented by Mr. Robert Faries, and is manufactured by the Faries Manufacturing Company, of Decatur, Ill. It is readily contracted to enter the tube, expanding by a quick forward movement and contracting by a reverse motion, allowing easy withdrawal. It is adjusted for different size tubes by turning the scraper on the handle or turning the handle in the scraper. The blades are readily removed for repairs or renewal by unscrewing a single nut. In all sizes larger than 2½ inches a ram may be employed, with a slip joint admitting of limited withdrawal of the handle without moving the scraper, when a quick forward movement gives a hammer or ram action on the scraper, enabling tight places to be passed. The bars on the scrapers are of hard spring steel, the blades of chilled cast iron, and the other parts of steel and malleable iron. The scraper is made in different sizes for all dimensions of boiler tubes, and for water tube boilers an extra strong heavy scraper is made.

THE FARIES BOILER TUBE CLEANER.

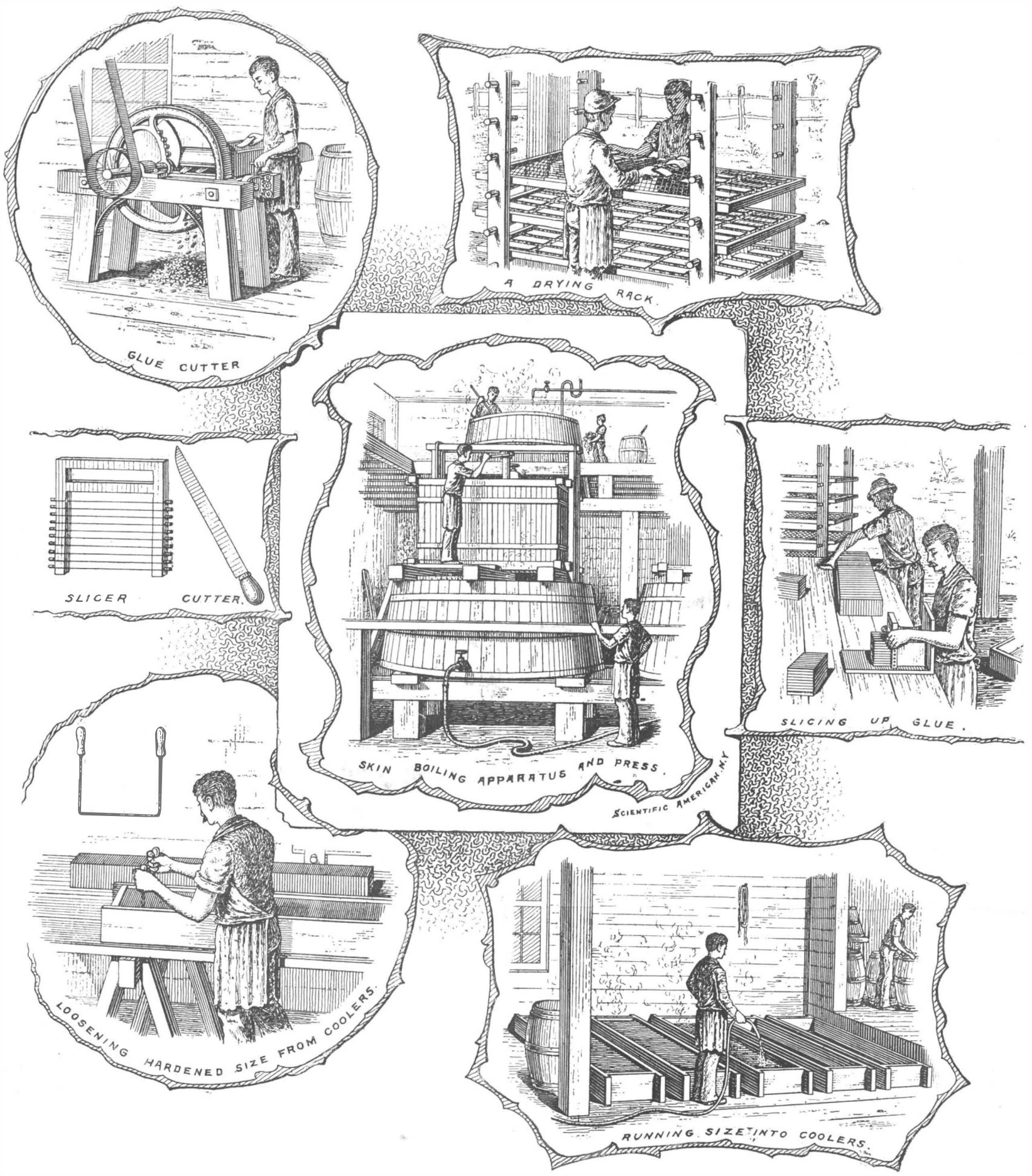
MANUFACTURE OF GLUE AND SIZING.

Glue is a form of gelatine which, on account of its impure condition, is employed only as an adhesive medium for wood, leather, paper and other substances. The gelatine-yielding substances are very numerous, comprising the skins of all animals, tendons, intestines, bladders, bones, hoofs and horns. In the preparation of ordinary glue the materials used are the parings and cuttings of hides from tan yards; also the ears of oxen and sheep, skins of rabbits, hares, cats, dogs and other animals. The material first passes through a boiling and straining process and then run into coolers, where it thickens into a jelly. The material is then taken out and cut up into slices and dried on frames of wire netting in the open air. The best time for drying is in the spring and autumn, frost and strong dry heat being injurious to the material. The plant from which the illustrations were taken manufactures glue principally from Australian and Russian cony rabbit skins. These skins are sold by hat manufacturers, after the hair has been extracted, to the glue makers in a shredded form. The glue and sizing are used principally by wall paper and window shade manufacturers, the sizing being run into barrels and sold in a jelly form. The material comes packed from the hat manufacturers in 4,500 pound bales, the shreds running about one-sixteenth of an inch in thickness and from 6 to 7 inches in length. The first process is the boiling operation. This is performed by putting about 350 pounds of the shredded skins into a wooden vat about 5 feet in diameter and about 5 feet in height. About 400 pails of water is then poured over the material and the mass allowed to boil for about 2 hours, the substance stirred up about every 15 or 20 minutes to keep it from settling. The boiling process thickens the water to about the consistency of molasses and is of a brownish color. It is then run off from the bottom of the vat into a press and strained. The press is about 4 by 4 feet square and about 3 feet in height and made of wooden slats. The sides and bottom of the interior of the press are first covered with heavy bagging. The material is then run from the vat and another piece of the bagging placed over the top of the fluid, over which a board covering is placed. The material is then strained or pressed out through the bagging and between the slats of the press by means of a hydraulic jack. A pressure of about 20 tons strains the material in about 2 hours.

From the press the hot liquid or size drops down into a receiving vat below. From this vat it is run by means of a hose into barrels holding from 450 to 500 pounds each. After each barrel is filled it is allowed to cool for from 8 to 10 hours until a skin is formed over the top. A cake of ice is then put on top of the size, if the weather is warm, which hardens it to about the consistency of jelly. In this condition it is sold to wall paper and window shade manufacturers. To keep the size from decaying, an acid preparation is added before the straining process.

For hard glue the hot size is run into coolers. These coolers are made of wood and are lined with zinc. They are about 6 feet in length, about 1 foot in width and about 6 inches in depth.

The coolers, which hold about 125 pounds each, are filled to within 1 inch of the top and are allowed to stand for about 12 hours. They are then brought to the drying shed and the material loosened from the box. This operation is performed by means of a piece of ¼ inch wire made to conform to the shape of the bottom and sides of the cooler. The operator presses the wire down to the bottom of the coolers at one end and draws it along the sides, cutting and loosening it, so that by turning the cooler over it can be taken out in a solid mass. This 6 foot cake of jelly size is then cut up in small cakes about 4 inches in thickness and passed to the slicer. These cakes are turned over on their sides and sliced lengthwise into small strips about 12 inches in length, about 4 inches in width and about ½ of an inch in thickness. The slicing is performed by an apparatus consisting of a number of fine pieces of wire stretched tightly across an iron frame about ½ of an inch apart, the operator drawing the wires through the material, cutting or slicing it up into a number of strips. The strips are then placed upon



MANUFACTURE OF GLUE AND SIZING.

drying frames. These frames are about 5½ feet in length and about 2 feet in width and are made of galvanized wire netting. The frames when filled with strips of glue are placed in racks about 8 inches apart, so that the air can circulate through them. The frames hold about 20 pounds each, the strips being placed so as not to touch each other. In a good, dry cool west wind the strips of glue will dry in about 1½ days.

During the drying process the cakes of glue shrink up about one-half. When the pieces have become quite hard they are washed, to remove dust from the surface and give them a glazed and polished appearance. A good quality of glue should be free from all specks and grit and should have a light brownish yellow transparent appearance and should break with a glassy fracture. Under the influence of heat it entirely dissolves in water, forming a thin sirupy fluid with a not disagreeable smell. The cakes when thoroughly dry are cut up into small pieces by means of two revolving knives traveling at the rate of about 300 revolutions per minute. The pieces of glue are first passed between two 4 inch toothed rollers which hold them in position, and also drawing them forward after each stroke of the knife. The pieces of glue are then packed into barrels ready for the market. Twenty-five hands can turn out 40,000 pounds of sizing per day and 25 tons of hard glue weekly. The sketches were taken from the plant of Charles De Clyne, New Durham, N. J.

THE THORNE TYPESETTING MACHINE.

(Continued from first page.)

load 6,000 ems of minion. Type used in the machine is the same as used for hand work, but is prepared for use in machines by being nicked on the side opposite the foundry nick, each character, space and quad having a combination of nicks peculiar to itself. This putting of nicks in the type is a very inexpensive and short job, for which the company have special machines. Each channel in the lower cylinder, which is stationary, is fitted with a combination of steel "wards" on one side, and the combination of nicks of one particular type, character or space corresponds with the combination of wards in one channel of the lower cylinder only, as shown in the sketch illustrating the work of distribution. The milling machine for cutting the channels in the cylinders was specially made by the company for this work, as were many of the other tools required in the production of the machine, it having been found impossible otherwise to obtain machines which would do work of the high degree of exactness and nicety required.

The distributing cylinder, having been loaded with matter for distribution, revolves with a step-by-step movement, each step bringing the different channels of the distributing cylinder into exact coincidence with the channels of the lower cylinder. The lowest types in the channels of the distributer, when brought over channels in the lower cylinder having combinations of wards corresponding with the combinations of nicks in their sides, drop into such channels, a spring in each channel insuring their positive movement when the right place is reached. They cannot go into any channel except that for which they are nicked; and as the channels, by the rotation of the cylinder, are made to coincide, or match, one hundred and twenty times per minute, and as frequently several characters find their respective channels at the same step of the distributer, over 10,000 ems can be automatically distributed in an hour.

It is a simple matter to take out surplus type in any channel when an excess of a particular letter has been distributed, or to replenish when a sort is exhausted before distribution supplies it. These surplus sorts are kept in type founders' galleys placed in a cabinet convenient to the machine, such galleys and cabinets being furnished with machines.

The keyboard resembles that of a typewriter, except that it is larger and has more keys. The keys are connected by levers, etc., to plungers, the ends of which when at rest are immediately behind the bottom letters in the channels of the lower cylinder. Immediately in front of and with its surface level with the bottom of the lines of type in the channels of the lower cylinder is a revolving disk, the axis of which is the same as that of the cylinders. The disk revolves rapidly from left to right, and, when the operator touches a key, the plunger to which it is attached ejects the lowest type of the corresponding channel out upon the disk, by which it is carried to the right hand side of the machine, where it is received on an endless belt, which carries it to a lifting apparatus, called the packer, which raises each successive letter into proper position in a continuous line. The marvelous accuracy and nicety of this operation is one of the phenomenal features of the machine. As one type follows another, the line is pushed along across the front of the machine, between the keyboard and the lower cylinder, through a channel called the typeway.

At the left of the keyboard is the second operator, who has before him a case containing spaces, quads, extra sorts, leads, etc., and separates with a grab set to the required measure as much from the continuous line of type in the typeway as will form a line of the measure required by the newspaper column or book page in process of composition, changing such spaces as it may be required to fill the line, and inserting hyphens when a division of the last word of the line makes this necessary. As the justifier reads the line while spacing it out, and corrects any errors he may find therein, the type set by the machines is remarkably free from errors where operators have become expert. Any errors which may have escaped the attention of the justifier are as readily corrected on the galleys as is ordinary hand-set matter.

The power required to drive each machine is very light, three to five machines being driven by one horse power electric motor. The machine is driven by two light belts, one of which transmits power to the revolving disk and the other parts of the setting apparatus, and the other, by means of an eccentric shaft and pawls operating on an index ring attached to the top of the upper cylinder, produces the step-by-step motion of the distributer.

The factory of the company, where all the machines are made, is at Hartford, Conn. One of our views represents one of the rooms in which the assembling of the parts and setting up of the machine is carried on. It has required several years' work to bring the machine to its present state of perfection, with adjustments so accurate and parts so nicely fitting, and withal working so easily that wear and the possibility of breakage are practically eliminated. All parts which occasion may require to be removed for cleaning or for adjustment may be readily removed by taking out thumb screws or bolts, thus avoiding the use of tools, and the cost of keeping the machine in good order after it has been once set to work, hardly figures at all in the running of one of these machines. The factory is at present turning out five machines a week, and there are over 500 machines now in use. They are sold for $1,800 each.

As will be readily understood, a different machine is required for each size of type, i. e., a brevier machine, an agate machine, a minion machine, a pica machine, etc. In all offices where special attention is paid to "style," and where fine work is a particular object, the advantages of the Thorne machine will be at once obvious to every printer, for, although the machine itself has so large a number of compartments for letters and characters, it is a very simple matter for the justifier to place italics or accented letters, chemical, mathematical, or other symbols, wherever desired, all the characters known to a printing office being as readily available for use in the composed matter as they would be in the work of composition by hand. And the perfect faces furnished by the skilled typefounder, for which a printer of the best class of work is always on the lookout, are always available for use in the machine, which is thus adapted to turn out, with greatly increased facility, every class of work within the range of the largest and best equipped offices.

History of the Electric Telegraph.

An interesting series of articles has been contributed recently to the Electrical World by Franklin L. Pope, concerning the history of the invention of the electro-magnetic telegraph. A large amount of evidence is presented in these articles on behalf of different claimants, and the author sums up as follows:

1. The first electro-magnetic apparatus for producing at will audible sounds at a distance was invented, constructed and operated by Joseph Henry in Albany, N. Y., in 1831.

2. The first electro-magnetic telegraph for producing at will permanent written marks at a distance was invented by Professor S. F. B. Morse in 1832, and constructed and operated by him in New York prior to September 2, 1837.

3. The first code of numerical conventional signs capable of being intelligibly written or sounded by the armature of an electro-magnet was originated by Morse in 1832.

4. The first code of alphabetical conventional signs capable of being intelligently written or sounded by the armature of an electro-magnet was originated by Alfred Vail in 1837-38.

5. The relay and combined circuits was invented by Morse prior to September 4, 1837.

6. The lever key, in its modern form, was invented by Vail in 1844.

7. The dry point recording register was invented by Vail in 1843.

8. The inverted cup of glass for insulating the line wire was invented by Ezra Cornell in 1844-45.

It may be that other documents, in existence and hitherto unknown to historians, may come to light in future years which will materially change the aspect of the question as it appears at the present time, but it has been my desire and intention in what I have here written, in the words of Henry, to render according to the present evidence scrupulous and exact justice to all who were concerned in the invention of the electro-magnetic telegraph. The development of this wonderful agency has been from first to last a characteristic and typical example of the great law of evolution, beginning with Henry's apparatus of 1831, and ending, at least until a recent date, with the familiar key and sounder of modern telegraphy. The work of Morse marks only an important and indispensable era in this process of evolution, not its ultimate conclusion, as many writers seem to have somewhat hastily assumed. Yet, in the gradually increasing use of the automatic system of transmission, probably destined to become universal in the future, we may recognize the possibility of a complete reversion to the original scheme of Morse, in which the alphabetical code will be the sole survivor among the contributions of others than himself to the general result.

The Trolley System in St. Louis.

A correspondent of the Evening Post says: A street railway president in this city remarked to day:

"The general introduction of electricity as a motive power has brought the officers and men of the street roads into closer relation than that they sustained under the old system. The primary cause of this is that it takes a higher order of intelligence to manage a trolley than it does to drive a mule. We have regular schools of instruction now which the men must attend, and this has brought the best of them forward. Ability is quickly detected by the questions asked and the interest taken, and wherever ability is found it is marked for promotion. One result of the school of instruction is that it is steadily reducing the percentage of accidents, and we expect to get this average below the old average on horse car lines. Under the regime of the trolley drink has been absolutely prohibited among employes, and the well remembered mule-whacker, whose capacity for whisky was only exceeded by his versatility in profanity, is of the past. He has been weeded out. It is an indisputable fact that a far better class apply for the position of motorman and conductor than were in the habit of seeking employment as driver or conductor. It is a sort of scientific job now, and not a few fare collectors have by dint of study and observation become pretty well informed electricians."

A mammoth generator and twin engines are being placed in the power house of a local company. Mr. Scullin, vice president of the line, when asked if it was made necessary by increased traffic, said:

"Not altogether. In the winter we expect to use it as a stove. We intend to heat all our cars by electricity in future, doing away with the unsatisfactory coal stove altogether."

A Land and Water Steamboat.

An interesting steamer is just about to be started on some lakes a few miles distant from Copenhagen, the peculiar feature being that the steamer has to make a short journey overland, the two lakes being divided by a strip of land. Across this a railway has been constructed, crossing a high road, which necessitates a gradient on both sides of 1:50, the metals being ordinary rails. At the two ends the rails have been carried into and under the water on a wooden structure. By means of piles the steamer is guided on to the rails, which correspond in position with two wheels fixed on each side of the steamer. The steamer goes then on to the rails at "full speed," and travels up the rails on the one side and down the incline on the other, into the water, where the propeller again takes over its function. The engine is comparatively powerful, and in addition to the usual propeller shaft there is another shaft, which, by means of a chain, works the small wheels on which the steamer crosses the rails. The boat also has a powerful brake to moderate its speed down the incline. The steamer is 44 ft. long, capable of holding seventy passengers, and the engine indicates 27 horse power. All the trials have passed off perfectly satisfactorily.

This reminds us of the celebrated Orukter Amphibolos, invented by Oliver Evans, of New York, in 1803, which traversed land and water. It was a boat provided with four wheels, for land service, and a propelling wheel at the stern for the water. It was driven by steam and operated with success.

It would rattle along over the ground until a stream to be crossed was reached, then plunge into the water, paddle across, then wheel up the bank, and away it would go. Oliver Evans was a prolific inventor.

Porosity of Glass.

That glass is porous to molecules below a certain weight and volume has been shown by recent electrolytic experiments made by Prof. Roberts-Austen, of the Royal Mint. A current was passed through a vessel containing an amalgam of sodium separated by a glass partition from mercury. After a while the amalgam was found to have lost a certain amount of its weight, while the same amount had been added to the mercury. The same result was obtained with an amalgam of lithium; but with potassium, whose atomic weight and volume are high, the glass could not be penetrated.

WATER VELOCIPEDE.

Apropos of the bicycle craze, it appears that the next thing in order is a machine of some kind that will be, in relation to water, what the bicycle is to land. The SCIENTIFIC AMERICAN of June 8, 1895, had an illustration of a machine called a nautical bicycle, but although it was nautical, it was not a bicycle in any sense, neither was it constructed to act on water as a bicycle does on land.

In fact, it was substantially the same device that may be seen any day in Central Park. It is generally admitted that a paddle wheel does not afford the best means of securing a leverage on the water, on a small scale.

The annexed engraving illustrates a machine which acts in relation to water as the bicycle does to a solid surface; that is to say, it gives the same opportunity for balancing, and depends on inertia for the upright position of the rider.

It consists of three hollow cylinders, with conical ends, and driving and steering mechanism. The outer cylinders are smaller than the middle one, and made of very light material, such as aluminum or paper. The middle one is made of galvanized iron or sheet copper.

The propelling device is provided with a two-bladed screw mounted on a shaft, which extends through an oblique tube, inserted watertight in the central float. The upper end of the shaft projecting above the float is provided with a friction wheel, taking motion from the large friction wheel on the short shaft, driven by a miter wheel connection with the pedal shaft.

The pedals and saddle are like those of a bicycle. The central float has a rudder beneath, with a handle bar corresponding with the handle bar of a bicycle. The small floats are connected with the main float by bars that are jointed, so that they may be raised up when the machine has acquired headway. A pair of rods connected with the bar serves to raise and lower the lateral floats, this mechanism being constructed to be operated by a pinion on the handle bar, and a rack connected with the rods and arranged to slide on the rudder post.

The rider mounts, gets under headway, then raises the lateral floats clear from the water and fastens them. After that he depends on his momentum for his upright position, as in the case of the bicycle. Should he lose his balance, the lateral floats will catch him and prevent accident.

NOVEL WATER VELOCIPEDE.

The Kodak Inside the Great Pyramid.

There have been many discussions about the object and hidden meaning of the Great Pyramid, but it now seems clear that it was erected, as were all the other pyramids in Egypt, as a tomb only, and that for one man. As obelisks, typical of life, are only found on the east side of the Nile, so the pyramids, memorials of death, are found only on the western side, entirely surrounded by countless graves, on the borders of the great desert and the cultivated valley.

The Great Pyramid was built, so we are told, about 3700 B. C., by King Khufu (in Greek, Cheops), and is the largest and perhaps the oldest of all. It is of vast size, being originally 480 feet high, with a base that would fill up Lincoln's Inn Fields, each side being about 760 feet long. Part of the top has been broken off, and also the smooth outer casing, leaving it in its present rough and step-like condition.

In the heart of this mass a small chamber was cleverly constructed, a quadruple roof of enormous granite stones preserving it from being crushed by the great weight above. A passage led to the exterior, and after the king's death he was mummied, placed in a coffin inside the sarcophagus, and dragged up into the chamber, the mouth of the passage being subsequently blocked up and concealed, so that the body should not be disturbed. The entrance was, however, broken open centuries ago, and the body destroyed long before modern times.

After stooping and climbing along for a great distance, each person helped by two Arabs, we found ourselves in the King's Chamber, one day in February, 1894.

I had taken a quantity of magnesium wire inside, and, as we were burning this, it suddenly occurred to me to try and take a photograph with my kodak. I had only brought it in with me to save it from being used as a football by the Arabs if I left it outside. There was no support and the heat in the tomb was intense, but I managed to lean, and at the same time hold the camera, against one of the walls, while an Arab burnt about one and a half feet of wire. The result fortunately is good enough to show the sarcophagus in the position it has occupied throughout all history for nearly 6,000 years. The lid and one corner are broken. It is possible to distinguish the place where the Arab lit the wire, and, at the end, dropped it, besides the names of several English tourists on the walls. It is also just possible to see one of the joints between the stones of the wall behind the sarcophagus, but it does not show very clearly, for even now, though no mortar was used, it is not possible to insert the finest blade between the stones, so perfect was the construction of this mighty tomb.—R. MacInnes, in the Kodak News.

A Remarkable Railway Accident.

A cablegram from Kobe, Japan, dated July 28, reports a most unusual railroad disaster, by which 140 Japanese soldiers lost their lives. A train of 23 cars was conveying 400 Japanese soldiers, who were returning from China, where they had taken part in the military operations. A heavy storm was raging and as the train was running along the sea wall on which the tracks approaching the city named are laid, an immense wave leaped over the wall, separating the train and derailing the engine and eleven cars, which plunged off the wall into the bay. Most of the men in the cars were drowned. The accident occurred at about 1 o'clock A. M., and the night was pitch dark. The sea was running so high that it was impossible to render any assistance to the men in the cars that had gone overboard, even had means been at hand to do so. Some of the men who managed to get out of the cars while they were in the water were dashed to death against the wall.

Portable Buildings.

La Revue Industrielle describes a sort of portable construction which, although, as we believe, it originated in this country, has nearly gone out of use here, while it is becoming popular abroad. This construction consists simply in suitable assemblages of iron pipes and connections, and has the great advantage that the pieces are light and portable, while the work is very readily put together with the simplest tools. France is now extending so rapidly its colonial possessions that these portable barracks, warehouses, hospitals, and dwellings are greatly in demand, and it seems to us that we, who can make iron pipe, and cast connections, at least as cheaply and skillfully as our friends across the Atlantic, might find such buildings useful and the materials for them very salable. No architect needs to be told how to combine iron tubes and connections so as to make a cheap and strong roof; but in the new French structures the system is applied to the floors, which can easily be trussed to sufficient stiffness. With covering and sides, and perhaps floors, of corrugated metal, such buildings answer well for temporary purposes; and to substitute expanded metal, covered with plaster or cement, for the corrugated sheets, is to make them much more comfortable and permanent, at a small additional expense. —American Architect.

Car Windows and Blinds.

Car windows that stick fast are a discredit to the builder and an aggravation to the traveler. The instances are rare where the design of cars contemplates that the windows shall remain closed. Generally they are put in with the evident intention that they shall be under the control of passengers. In warm weather it is customary for passengers to desire and have the windows open in order to get the benefit of the refreshing inrush of air. The landscape is generally seen also to better advantage through an open window.

These conditions will probably not be changed materially for some years to come, and certainly not until means are employed to artificially cool cars for the summer as carefully as we now warm them in winter. When one enters a car in summer that is uncomfortably warm and is balked in his efforts to raise a window, he at once feels that he has a grievance against the railroad. This does not help earnings along any, but tends to the contrary. All objectionable features that travelers meet with tend to reduce earnings on the lines tolerating them, either by diverting patronage to other lines or by making trips less frequent. For these reasons special attention should be given to the construction of car details to insure that they will remain in condition to properly meet their intended purpose. Windows when designed to be opened or closed at the will of those who sit by them should be made to do this easily, and there should be enough of clearance provided between the movable sash and the frame to prevent sticking in wet weather.

The old wooden blinds for car windows that raise and lower like the windows have many friends and are still in wide use on numerous roads. The roller shade is fast supplating them, however, and properly so. In the long run shades of proper material and fixtures may cost more than blinds, but they have numerous advantages that are of money value to any railroad, the chief among these being the ease with which they may be raised or lowered to the desired position, and the improved appearance they give to both the interior and exterior of cars. Wooden blinds frequently stick fast, and are obstinate in their movements on nearly all occasions. They are trappy and inconvenient. Roads that are giving increased attention to the refinement of details that affect the comfort of their patrons are getting rid of them.

Another point in the construction of car windows is the height to which the sash should rise with reference to the vision of passengers seated by them. Frequently this receives no consideration, and the result is that the lower piece of the sash frame comes directly in line with the eyes of a seated passenger when the sash is up. To see out when seated beside such a window one needs the neck of a giraffe so that his head can be easily raised or lowered to see above or below the obtruding piece of wood. Windows that are amply large, that move easily, and that rise to a good liberal height and are spaced to conform with the spacing of the seats are the only kind that ought to be used.—Nat. Car Builder.

Malleable Iron.

Prices of both malleable iron and steel have fallen very much in the last few years, and the manufacturer of malleable castings can duplicate almost any cast iron work about a car, in malleable iron, at 50 per cent of the weight of the gray iron. This enables him to offer to railroad companies malleable castings to take the place of gray iron, at a cost to them somewhat less than that of the gray iron castings. The weight of the gray iron castings cannot be reduced without danger of breakage, and so the car owner finds it to his interest to use a material which, though costing more per pound, costs less per casting. Steel comes into play where a greater strength is required than can be obtained with either of the other two metals.—Iron Trade Review.

By act of the Legislature of the State of Ohio a clay-workers' school has been established at the Ohio State University, where the chemistry, mechanism, and manual work of everything connected with clay industries is taught. Prof. Orton is the director of this school.

THE NEW BICYCLE PATH, OCEAN PARKWAY, BROOKLYN, N. Y.

The residents of the city of Brooklyn, N. Y., are fortunate in possessing one of the finest cycle paths ever constructed. This path is used not only by Brooklynites, but by wheelmen from New York and all the surrounding towns. The cycle path occupies one side of the Ocean Parkway, which extends from the Fort Hamilton Avenue entrance of Prospect Park to Coney Island, New York's favorite seaside resort, a distance of five miles. The Good Roads Association, of Brooklyn, advocated for a long time the building of this path, and at last $3,000 was raised by contributions from wheelmen and the remainder of the cost was paid by the Department of Parks.

We present a photographic view showing the cycle path and the Ocean Parkway taken from a point near the park. The Ocean Parkway is 210 feet wide, and is composed of a driveway, 70 feet wide, two footpaths and two wagon roads, all being separated by trees. The right footpath going toward Coney Island has been used for the cycle path, and so great is the throng of cyclists that there is now talk of converting the other footpath for a return cycle path. The new cycle path is five miles long and fourteen feet wide, extending in a straight line from the park to the ocean beach at Coney Island. The path is composed of a foundation of sand, on which is placed a top coating of blue rock screenings, which affords an ideal track for wheelmen.

Many of the riders approach the path by way of the park, others prefer the fine outer dirt paths which encircle the park. Wheelmen are allowed to use these paths equally with pedestrians, and the curbs have been beveled off to enable unskillful riders to cross the roads without the necessity of dismounting. A speed of eight miles an hour is permitted on the cycle path, which is patroled by keepers mounted on bicycles. At night the path is fairly well lighted, and for a short distance is lighted by electricity. It is proposed to light the entire path by arc lights. Cyclists are required to carry lamps at night, when riding on this path. There are road houses, and bicycle repairing establishments along the path, so that in case of a mishap, the rider can have his wheel quickly repaired.

The cycle path was formally opened on June 15, 1895. The cycling parade was under the auspices of the Good Roads Association, of Brooklyn. The weather was perfect and about 10,000 wheelmen and women went over the new path. The cycle path is very popular and is visited by an average of 2.000 wheelmen per day. Twenty-five tandems have been counted on the path in one day.

The new bicycle race track at Manhattan Beach, Coney Island, is reached by the Western Boulevard, which intersects the cycle path just above the Brighton race track. This new track cost about $60,000, including the necessary buildings. The total seating capacity on the stand is 8,000.

The track is composed of 8 inches of ashes and concrete with 4½ inches of crushed granite, powdered cement and sand. The outer bank is 6 feet and $\frac{6}{10}$ inches higher than the inside slope. The arrangements for draining are elaborate. The main drainage pipe is 12 inches in circumference and laterals are 4 and 6 inches; they are covered with stones and ashes. The tides will not affect the track or field. The track is 26½ feet wide, except on the homestretch, where it is 40 feet wide. Black lines have been drawn out so that a rider can tell just where he is without looking up. Ample accommodations are provided for the storage of bicycles, and when no races are being held the track may be used for practice. Many important bicycle races have been held on this track, which is under the direction of the National Cycle and Athletic Club of Coney Island.

THE NEW BICYCLE PATH, OCEAN PARKWAY, BROOKLYN, N. Y.

The Electric Man.

And now Niagara Falls will probably be the location of a factory for turning out electric men; not mesmerists or svengalis, but automatons that will run by electricity. They have built one up at Tonawanda at the Gillie, Goddard & Company's plant, where they turn out merry-go-rounds. This man has been on the streets of that town. It is an invention of Philip Perew, who has secured a patent. The idea is by no means perfected. At present all the man is good for is to pull a cart about the streets of a city. The model that has been exhibited in Tonawanda to the delight of the populace and the honor of a certain soap is but a crude thing. The man clothed in Continental uniform drags a heavy cart with some ease, while on the sides of the cart flaring signs exalt the glory of soapor pills, as the case may be. The model has been on the streets of Tonawanda, and it worked well. It was so alluring that the small boy flocked in such dense swarms that the policeman was summoned to chase him away. The man was about seven feet tall, and was modeled after William F. Sheehan. The cerulean of its eyes matches that of its famous counterpart exactly. The men, though, that the firm will make will be run by storage batteries, and have a phonograph. The phonograph can say whatever is desired. It can expound the virtues of patent medicine or be used for political campaigns. So, at present, the only form of labor threatened by the invention is that of the sandwich man and that of the campaign speaker. The men and carts that are used to extol medicines will be very fine pieces of mechanism, and can be geared to go as fast as any one desires. By simply turning on a current, the man, his eyes still fixed on eternity, can hump down the street at a rate far exceeding any bicycle. The limit has not been reached. In course of time it may be that men can be constructed to do almost anything, and the laboring man can sit around and smoke twenty-five cent cigars while a multitude of electric men do all the work. This will not occur for some years yet, but no one can say where it will stop.—Niagara Falls, N. Y., Gazette.

Our Foreign Commerce.

The Secretary of Agriculture issued, August 15, a circular on the imports and exports of the United States for 1893 and 1894. It shows that, notwithstanding the depression of business, exports from the United States in 1894 were valued at $889,843,000, against $847,665,194 in 1893. Three-fourths of that vast value came from the farms and farmers of this republic.

Great Britain and Ireland lead all the other countries in volume of trade with the United States. The English-speaking people of Europe bought of the $889,000,000 of American exports $451,000,000 worth, and, taking the British possessions all together and as one customer, they took $523,000,000 worth, or nearly sixty per cent of the whole, during 1894.

The United States imported from Great Britain $107,000,000 worth of her products in 1894, or 16·4 per cent of our entire imports. And from all of the British possessions, together with the United Kingdom, $178,000,000 worth, more than 27 per cent. Almost 90 per cent of the total United States exports were to the United Kingdom and British possessions, Germany, Canada, France, Netherlands, and Belgium. Of imports, after the first place held by the United Kingdom and the British possessions, follows Germany, with a valuation of $96,000,000; Spanish West Indies, $82,000.000; Brazil and France, $76,000,000 each, and Canada $37,000,000.

What We Need.

What the man of to-day needs most is not athletics in a gymnasium, but plenty of fresh air in his lungs. Instead of a quantity of violent exercise that leaves him weak for several hours afterward, he needs to learn to breathe right, stand right, and sit right. The young man or young woman who starts on a career of training, and keeps it up year after year, just at the time when the body has a great deal of its own natural work to do and wants to do it, may make up his or her mind that beyond a showy and superficial development of muscle and strength, all this training, in after life, is going to count against them.—Annals of Hygiene.

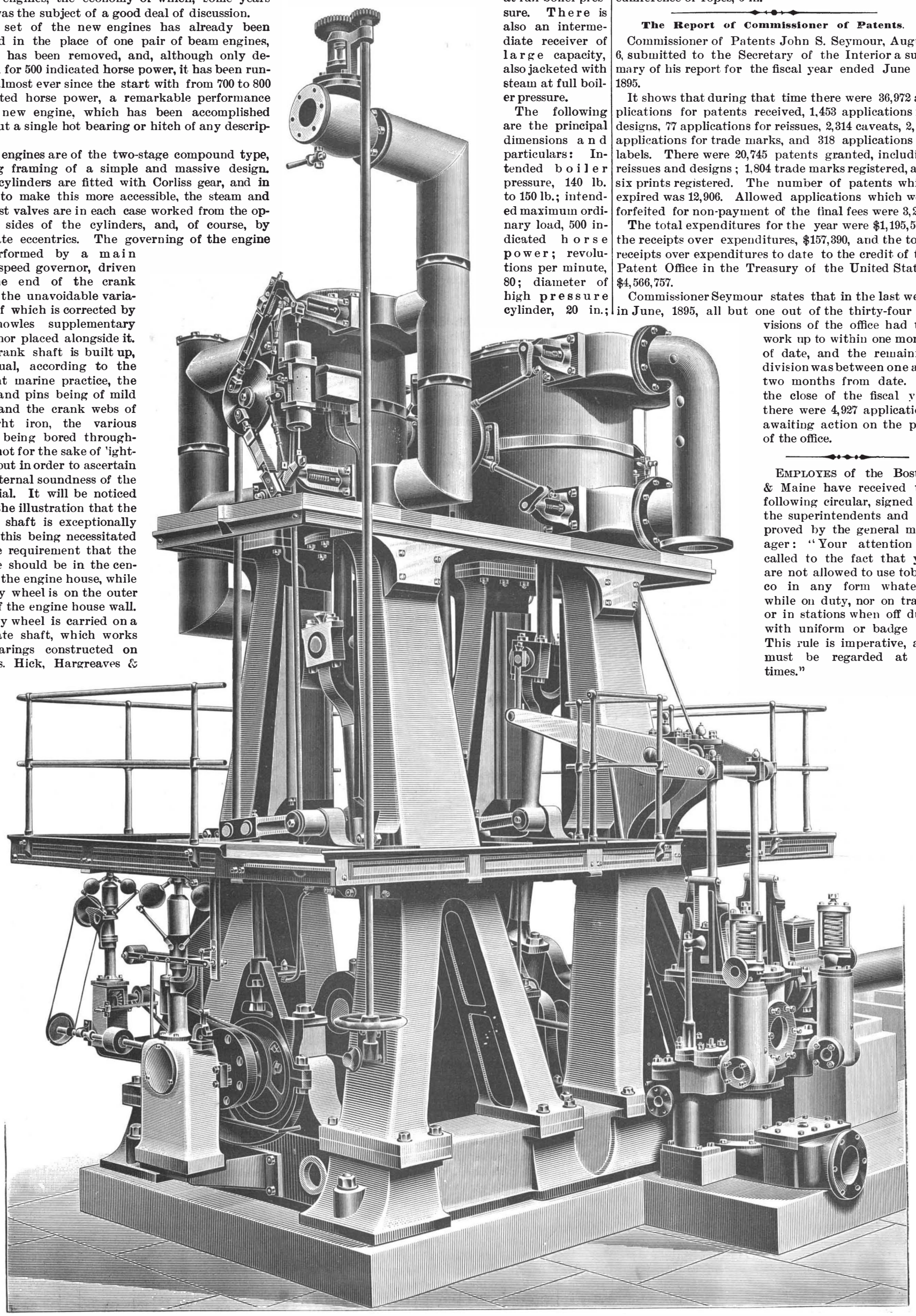
FIVE HUNDRED I. H. P. COMPOUND ENGINE.

We illustrate one of two duplicate sets of 500 indicated horse power engines recently constructed by Messrs. Hick, Hargreaves & Company, Soho Iron Works, Bolton, to the order of Sir Titus Salt, Bart., Sons & Company, for their well-known Saltaire Mills. The Engineer, to which we are indebted for our engraving, says: These engines take the place of the beam engines, the economy of which, some years ago, was the subject of a good deal of discussion.

One set of the new engines has already been erected in the place of one pair of beam engines, which has been removed, and, although only designed for 500 indicated horse power, it has been running almost ever since the start with from 700 to 800 indicated horse power, a remarkable performance for a new engine, which has been accomplished without a single hot bearing or hitch of any description.

The engines are of the two-stage compound type, having framing of a simple and massive design. Both cylinders are fitted with Corliss gear, and in order to make this more accessible, the steam and exhaust valves are in each case worked from the opposite sides of the cylinders, and, of course, by separate eccentrics. The governing of the engine is performed by a main high speed governor, driven off the end of the crank shaft, the unavoidable variation of which is corrected by a Knowles supplementary governor placed alongside it. The crank shaft is built up, as usual, according to the present marine practice, the shaft and pins being of mild steel, and the crank webs of wrought iron, the various parts being bored throughout—not for the sake of lightness, but in order to ascertain the internal soundness of the material. It will be noticed from the illustration that the crank shaft is exceptionally long, this being necessitated by the requirement that the engine should be in the center of the engine house, while the fly wheel is on the outer side of the engine house wall. The fly wheel is carried on a separate shaft, which works in bearings constructed on Messrs. Hick, Hargreaves & Co.'s patent swivel pattern. The power is transmitted by ropes to the various line shafts of the mill, giving a much more direct and simple arrangement than had previously been in use with the beam engines. The engines are surface condensing, the condensers formerly used for the beam engines being adapted for the purpose. The cylinders are of the makers' well-known built-up type, and are jacketed with steam at full boiler pressure. There is also an intermediate receiver of large capacity, also jacketed with steam at full boiler pressure.

The following are the principal dimensions and particulars: Intended boiler pressure, 140 lb. to 150 lb.; intended maximum ordinary load, 500 indicated horse power; revolutions per minute, 80; diameter of high pressure cylinder, 20 in.; diameter of low pressure cylinder, 38 in.; stroke of both, 3 ft.; diameter of piston rods, 4½ in.; crank pins, diameter, 9¾ in.; length, 11 in.; crank necks, diameter, 9¾ in.; length, 12 in.; bearings of wheel shaft, diameter, 11 in.; length, 22 in.; connecting rod, length centers, 7 ft. 6 in.; air pump, diameter, 17 in., stroke, 12 in.; feed pumps (two), diameter, 3 in., stroke, 12 in.; rope drum, diameter, 16 ft.; number of ropes, 14; circumference of ropes, 5 in.



FIVE HUNDRED I. H. P. COMPOUND MILL ENGINE AT SALTAIRE.

The Report of Commissioner of Patents.

Commissioner of Patents John S. Seymour, August 6, submitted to the Secretary of the Interior a summary of his report for the fiscal year ended June 30, 1895.

It shows that during that time there were 36,972 applications for patents received, 1,453 applications for designs, 77 applications for reissues, 2,314 caveats, 2,183 applications for trade marks, and 318 applications for labels. There were 20,745 patents granted, including reissues and designs; 1,804 trade marks registered, and six prints registered. The number of patents which expired was 12,906. Allowed applications which were forfeited for non-payment of the final fees were 3,208.

The total expenditures for the year were $1,195,557; the receipts over expenditures, $157,390, and the total receipts over expenditures to date to the credit of the Patent Office in the Treasury of the United States, $4,566,757.

Commissioner Seymour states that in the last week in June, 1895, all but one out of the thirty-four divisions of the office had the work up to within one month of date, and the remaining division was between one and two months from date. At the close of the fiscal year there were 4,927 applications awaiting action on the part of the office.

EMPLOYES of the Boston & Maine have received the following circular, signed by the superintendents and approved by the general manager: "Your attention is called to the fact that you are not allowed to use tobacco in any form whatever while on duty, nor on trains or in stations when off duty with uniform or badge on. This rule is imperative, and must be regarded at all times."

Correspondence.

The Rawhide Cannon.

To the Editor of the SCIENTIFIC AMERICAN:

Referring to your account of a rawhide cannon in a recent issue, I would say that the inventor is wasting both his time and his money. Any greater lightness in field guns is undesirable and would seriously injure their accuracy. Guns onsiderably lighter than those now in use could be safely made from good steel, but their range and accuracy of fire would be lowered.

The explosion of the powder merely parts the gun and the shot. The range of the shot depends upon the slightness of recoil in the gun. And the accuracy depends on the weight and steadiness of the gun until the shot is well clear of the muzzle. Over half the metal in a common Winchester rifle could be safely removed, but the range and accuracy of the piece would be partly lost. For good artillery practice, guns must be heavy. The saving of weight is unimportant.

It is claimed that the rawhide gun kept cool in firing. It makes no difference about the outside of the gun keeping cool, for it is plain that the inner tube will become hotter than the inside of an ordinary gun. And it will not cool as an ordinary gun will. The reason for its getting hotter and not cooling is because it is surrounded by a non-conductor—the rawhide.

ANDREW VAN BIBBER.

Cincinnati, August 8, 1895.

Low Wages in Japan.

Consul-General N. W. McIvor, writing from Kanagawa, Japan, April 15, gives the following as the rates of wages prevalent at Yokohama in January of this year, the working day being ten hours. When it is remembered that Japan has a population nearly as large as that of France, and that within twenty-five years it has advanced from comparative obscurity as a semi-civilized nation to one which has to be reckoned with as an important factor in the world's commerce and manufactures, competing actively and with constantly increasing energy with the western nations in all that pertains to supplying the eastern markets, the significance of these figures cannot be ignored.

PER DAY.

Carpenters	$0.26
Plasterers	26
Stonecutters	31
Sawyers	29
Roofers	26
Tilers	31
Matting makers	24
Screen makers	26
Joiners	29
Paperhangers	24
Tailors:	
For Japanese clothes	24
For foreign clothes	48
Dyers	24
Cotton beaters	17
Blacksmiths	36
Porcelain makers	24
Porcelain artists	38 to 72
Oil press men	24
Tobacco cutters	24
Printers	19
Ship carpenters	29
Lacquer workers	24
Compositors	29
Sake brewers	22
Silk spinners (female)	17
Tea workers, picking and preparing	29
Tea firing:	
Male	10 to 14
Female	7 to 12
Common laborers	19
Confectioners	17
Sauce makers	24

PER MONTH.

Farm laborers:	
Male	$1.44
Female	1.20
Silkworm breeders:	
Male	1.92
Female	96
Weavers (female)	96
Servants in foreign houses:	
Male	2.88 to 7.20
Female	2.40 to 4.80

Cure of Bites of Venomous Serpents.

MM. Phisalix and Bertrand erroneously ascribe to the author a view which he repudiates, i. e., that chloride of lime has a vaccinal action. Conclusive experiments with chloride of lime have been made successively upon human subjects, especially by Prof. Halford, at Melbourne. He is now sending immunizing serum in considerable quantities to India, the Antilles, and Australia. It is sufficient to inject into rabbits a dose of the serum equal to 1-10,000 of their weight to enable them to bear afterward, without danger, a dose of venom capable of killing check specimens in from three to four hours.—A. Calmette.

Japanese Leather Paper.

Some years ago, the Japanese government established an imperial press, which does all the printing work of the government, from the alphabets ordered by the Minister of Public Instruction, and the postage stamps and post cards, to the paper money, of which so much use is made in trade. One of the specialties of the establishment is the manufacture of leather papers, which has been brought to a great degree of perfection, and is so distinctly Japanese. The Japanese, taking as a pattern some of the finest European leathers, have succeeded in applying their own peculiar methods of manufacture, and fashion them according to the Japanese taste. Papeterie has published some details of this essentially artistic industry. The first step is the engraving of a block, consisting of a large, hard wooden cylinder, hung on to a frame, which is engraved with a knife or chisel, the worker following the model with such precision and exactitude that the least wrong stroke is considered sufficient to spoil the whole block. When the block is ready it is covered with moist paper, which is folded and pressed on to the mould, then taken off and hung across a bamboo to dry. When it is thoroughly dried, by exposure to the air, decoration is commenced.

The paper is now spongy, and almost as absorbent as blotting paper. It is now covered with several coatings of glue, which makes the surface smooth and non-absorbent. The paper is then figured, metallized, and varnished, and the figured design then stands out, as if gilt. The Japanese have the monopoly of the best lacquer varnish. It is this lacquer varnish which gives a golden appearance to the metal, and the exact color is at the discretion of the worker. The final operation consists in the arrangements of border patterns, by means of stencil plates. This is done by young girls, who cut out the stencils with marvelous cleverness and exactness, and wield the brush with great dexterity. The same girls touch up the border work, erasing all smudges and filling up blank spaces, etc. The rolls of paper are then hung up again, and when dry are ready for the market. They are sent first to Yokohama, and thence all over the world.

One other remarkable fact about the Japanese imperial press is, that it was the first experiment in Japan of industrial organization on a large scale, at least, so far as concerns the regulating of hours of labor. Since then labor has been organized and regulated in the same manner in the private factories of the country, to the mutual profit of the producers and the workmen employed.

The Cultivation of Chicory in Belgium.

The Belgian government considers chicory a perfectly legitimate drink, on an equality with coffee and chocolate, for the adulteration of coffee, chicory, and chocolate, and the sale of such adulterated articles, are prohibited by law. All varieties of chicory, according to Jussieu, are indigenous to the European continent. The United States consul at Ghent says that all these varieties may be traced back to the chicorée sauvage (Cichorium intybus) and the chicorée endive (Cichorium endivia). The former, commonly called small chicory, is especially cultivated for its leaves, which make an excellent salad. This wild chicory, so called, is a very common perennial plant in Belgium, and is frequently cultivated in gardens. It has a fusiform and tap root; its stalk grows three feet or more in height. It is abundant along the roads and in the pasture lands of Belgium; in the gardens it develops much more, the height of the stalk often exceeding six feet, and its leaves are larger. The plant is sown in the spring, sometimes in beds, but more often along the borders. It only requires watering, and ordinary tilling and weeding. The green leaves only are ordinarily employed in medicine and domestic economy. For this purpose it is necessary to cut them from time to time, thus inducing new and more tender leaves to shoot forth; the stalk, too, must be frequently cut in order to delay as much as possible the florescence. Wild chicory is also an excellent fodder plant. Its most valuable property is its ability to grow in the worst soils, even such as are barren, chalky, or clayey. Almost all cattle eagerly hunt for the plant, and cows, which at first dislike it, rapidly become accustomed to its taste. By reason of its bitterness it acts as a tonic, and animals who feed upon it are much less exposed to cutaneous diseases. Swine are especially fond of the roots.

Among the varieties of wild chicory just described, the most important is chicory with large roots, known as "coffee chicory." It is a perennial plant, whose root, by torrefaction, acquires a bitter flavor and an aroma which is not unlike that of sugar converted into caramels. This is the variety which is daily increasing in commercial and industrial importance. In Belgium it largely replaces coffee in the lower ranks of society. West Flanders, in the district around Courtrai and Roulers, is its principal home. The method of its cultivation greatly resembles that of the beet. The seeds, which are very small, are sown by a hand drill, three rows at a time, during the months of April and May, and they are sown at a distance of about 15 inches apart. There are several varieties, or, rather, subdivisions, of this variety. The two chief ones are known as the "wide leaved chicory" (à larges feuilles) and the "eel-headed chicory" (frisees a têtes d'anguilles), of which the latter is considered the best. The seed is obtained by replanting in the month of March, the old stalks being dug out during the preceding autumn. In the course of a few weeks these go to seed. Each plant gives about 300 grains of seed. Another estimate gives 530 pounds of seed per acre. A temperate climate is required, and a vigorous soil, even slightly clayey, produces the best chicory with the heaviest roots. Sandy soils also are good, but the roots are generally lighter. The soil must be plowed several weeks in advance.

About 160,000 plants are raised per acre. A crop of 11 to 14 tons of green roots is produced per acre. The harvest takes place in October and November. The roots must be immediately washed and dried, and then may be preserved for 15 to 18 months. The seeds, if put in a dry place, may be kept for seven years. The plant has no known diseases, but is subject to the attacks of a worm which eats the roots. The leaves of the plant generally grow in a small tuft, are narrow, and do not exceed 10 or 12 inches in height. The roots are carrot shaped (slightly larger), dark gray in color on the exterior, and nearly dead white in the interior. The roots are dried on perforated racks in kilns by means of coke fires, and are then cut by machines into small pieces. These are known as cossettes, and chicory is generallv exported to America in this form. Afterward it is ground and sold in powder under the name of granulated chicory. Only very recently a royal decree has been promulgated in Belgium declaring the essential qualities of pure chicory, requiring all packages to be legibly marked with the name, and forbidding under heavy penalties the sale of any adulteration as the genuine article. A similar law exists respecting coffee.

Rat-tailed Grubs.

The specimens received from Mr. D. L. Phillips, of Little Rock, Arkansas, and which he found in the bottom of an old bucket in which had been kept a decoction of tobacco stems, were very much damaged and scarcely recognizable by virtue of the fact that the vial had become uncorked and the liquid as well as the specimens all dried up in transit. It so happens, however, that even in this desiccated condition the long filamentous termination of the body indicated sufficiently the character of the creatures. They are what is known as rat-tailed maggots, the larvæ of two-winged flies belonging to the genus Eristalis. Flies of this genus have a general resemblance to some kinds of bees, not only in color, but in their humming flight. One of the commonest species (Eristalis tenax) has, in fact, often been confounded with the hive bee. Their larvæ are semi-aquatic, often being found in foul water, in decomposing wood, tan pits, privies, and other like foul and semi-liquid substances and situations. They are characterized by having long extensile caudal extremities or tails, by means of which they are enabled to breathe, these tails being, in fact, breathing tubes. The underside of the body is furnished with seven pairs of membranous projections or feet provided with small hooks, and by these two peculiarities they differ from all other larvæ of their order, as no other dipterous larvæ are known to have such well developed pseudopods. When full grown, these rat-tailed larvæ quit their aquatic or sub-aquatic surroundings, bury themselves in the ground or hide under other moist places. Here the body contracts and hardens, the tail-like respiratory organ dies away, and four small respiratory horns develop in the front part of the body near the head. The allied genera Helophilus and Xylota have somewhat similar rat-tailed larvæ. It is a peculiarity of many Dipterous larvæ that they are able to live in the foulest substances and in situations where most other insect larvæ would perish.—C. V. Riley.

Wind Velocities and Pressures.

Mr. E. F. Miller, in the Proceedings of the Engineers' Club of Philadelphia for April, gives a table of wind velocities observed by the United States Weather Bureau at Philadelphia. For calculating the pressure per square foot the equation used was: $P = 0{\cdot}004\ V^2$. The table is as follows:

Highest velocity in the month of	Occurred in the years of	Velocity recorded by anemometer M. P. H.	Corrected velocity M. P. H.	Corresponding pressure per sq. ft.
January	1878 & 1885	52	42·2	7·13 lb.
February	1876, '80, '86	48	39·3	6·18 "
March	1888	60	48	9·22 "
April	1879	50	40 8	6·67 "
May	1889	60	48	9·22 "
June	1889	46	37·8	5·72 "
July	1876	40	33·3	4·44 "
August	1893	55	44·4	7·89 "
September	1889	54	43·7	7·64 "
October	1876	75	58·7	13 74 "
November	1873	66	52·3	10 94 "
December	1876	63	50·2	10 08 "

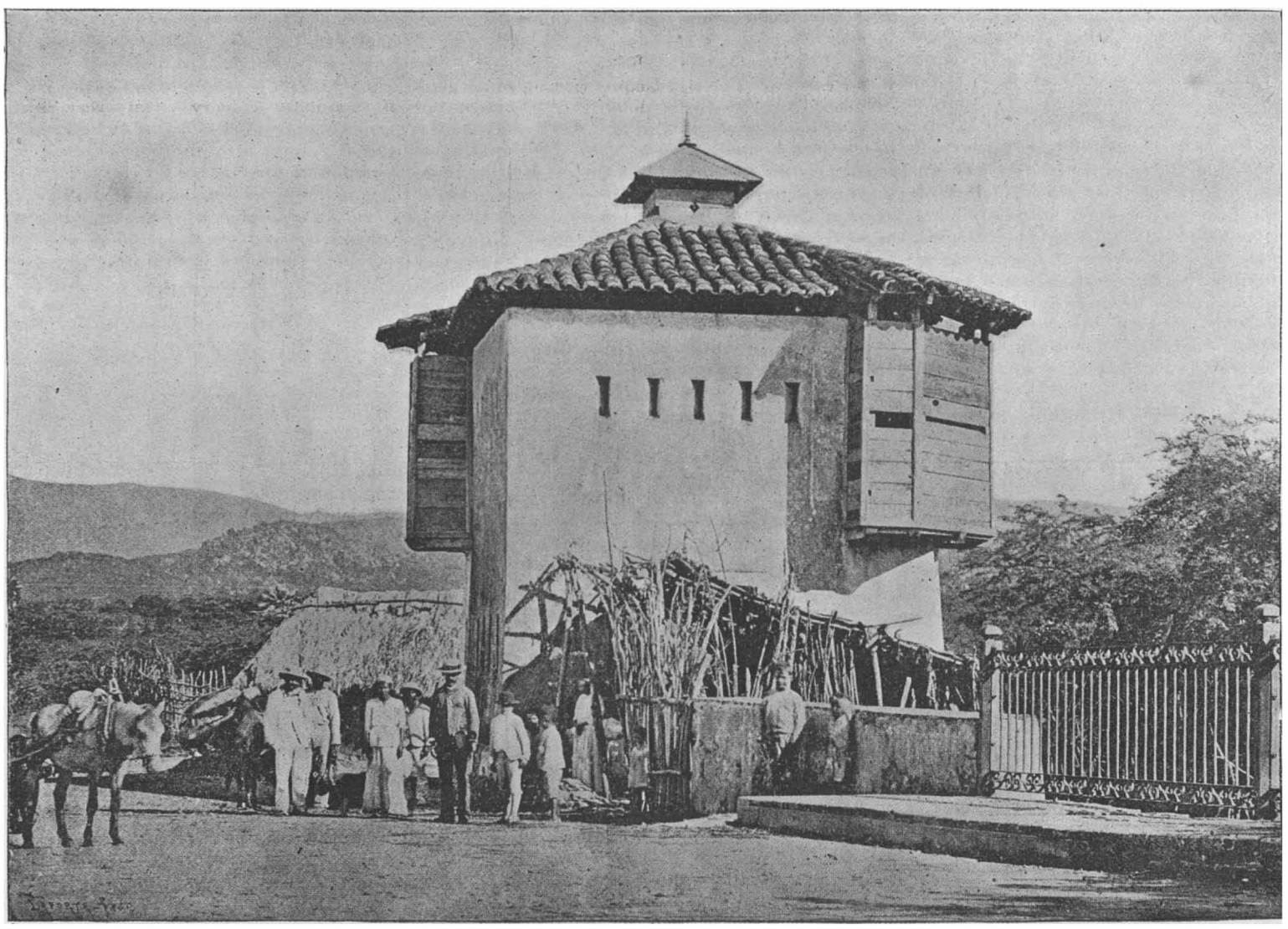
THE CUBAN INSURRECTION.

At the entrance to the city of Santiago de Cuba, on the royal highway of the island, stands the fort of Jarayó. It is one of many similar structures that were built by the Spaniards at the time of the former insurrection, twenty years ago, for the defense of the entrances to the principal towns. Jarayó guards the head of the bridge over the river of the same name, and is garrisoned by a company of soldiers under the command of an officer. The fort is built of mortar concrete, like all the others that were erected as before mentioned; and although it has been attacked many times by the enemy, they have never been able to effect its capture.

The city of Santiago de Cuba is situated on the south side of the island near the eastern extremity, and is the capital of the province of the same name. The province is divided into seven judicial districts, among which are Manzanillo, Bayamo, Holguin, Baracoa and Guantanamo. The province of Santiago de Cuba is at present the scene of active hostilities between the Cubans and the Spaniards. We are indebted to La Ilustracion Espanola for our engraving.

The distinguished Spanish statesman and patriot Pi y Margall has lately given expression to his views on the condition of Cuba, in an article published in El Quijote, a Madrid newspaper. He urges the Spanish government as a measure of justice to come to terms with the Cuban insurgents without delay, by granting them freedom and independence. He reminds the Spanish people that no nation has the right to occupy territories populated by other people unless with their consent. If a nation occupies them by force those conquered can at any time fight them until they drive them from their soil. For two centuries, he says, Spain fought for independence against Rome. During seven centuries the Spanish people fought against the Arabs, who occupied the choicest regions of the peninsula. The Spaniards did not lay down their arms until the Moors were driven out over the sea to Africa. At Malaga the Spaniards even robbed the departing Moors of their jewelry. "If we acted in that way," says Senor Margall, "is it just that we denounce as bandits those who are now fighting against us for their independence? For the same deeds and the same cause must we call those bandits whom here we call heroes? Those who drove us away from Mexico, Guatemala, Colombia, Ecuador, Venezuela, Peru, and Chile are hailed as heroes all over America and over the world. Let us be just to those who are now fighting in Cuba. If there is now war in Cuba, it is all our own fault. It is our duty to mend our error and stop it. Let us allow them to govern themselves politically and economically; and in order that they may be grateful for our generosity, let us help them to their autonomy without any disturbances or bloodshed."

We regret our limited space prevents us from giving the full text of this enlightened and admirable essay.



FORT JARAYO, NEAR SANTIAGO DE CUBA.

A New Method of Making Lantern Slides.

BY E. W. SCRIPTURE, YALE UNIVERSITY.

In lecturing on experimental psychology I have found it useful to project on the screen numerous views from the illustrations in my book, "Thinking, Feeling, Doing." At first I prepared the slides, at considerable expense, in the usual way by photography; but it finally occurred to me that it might be possible to print directly on glass from the blocks used in the book.

The electrotypes were obtained and the glass printer in a clock factory was found to do the work. After several experiments, the correct method was established.

The metal portion of the cut is mounted on a board of a thickness suited to the particular frame used in the printing.

It is inked with a fine ink (e. g., a $2 cut or ex-job ink), tempered to the proper consistency with Calcutta boiled oil and japan drier. The precise degree of temper depends on temperature, humidity, and other conditions.

The inking is done by a simple hand roller, of the kind used in ordinary printing.

The block lies face upward on the table and the piece of plain glass is placed at the appropriate distance on a level with it. A composition roller of glue and molasses, made a trifle harder than the regular printer's roller, is then run forward on two guides. As it passes over the block it takes the impression. On reaching the glass, after one complete revolution, it transfers the ink impression directly to it. I do not think it possible to run this roller evenly enough without the steel guides; at any rate, it would not pay to waste time in trying it.

The result is a print on the glass just as if on paper. Curiously enough, the prints on the glass are superior to those on paper from the same block. The positives are then finished up as lantern slides in the usual way.

The superiority of the process lies in its great cheapness. Ordinary slides never cost less than 50 cents each. Prepared in my way, the first slide costs about 75 cents, but the future slides from the same block do not cost over 5 cents each.

The possibilities of the method are extensive. The publisher of an illustrated book, for example, can print off sets of slides for lecturers. Lectures on art, botany, geology, history, etc., can be provided at a small cost. Moreover, views not taken from books could be prepared by first turning them into zinc etchings, halftones, or wood cuts and then printing from the blocks. The extensive use of the lantern for purposes of instruction in the common schools is impracticable at present, mainly owing to the cost of the slides. With printed slides at a trifling cost the difficulty is removed.

People often complain that new ideas may be useful, but that, when any one wants to put them in practice, it is difficult to find just the proper method. I have given a description that makes the method possible to any glass printer, or to any one willing to learn by practice. Where such persons are not available, I am willing to put any one into communication with the printer of my own slides.

The Pigeon Tremex.

ANSWER BY PROFESSOR C. V. RILEY.

The insect sent by Mr. Edward Pollock, of Lancaster, Wis., about an inch and one-half long, with brownish-black body, four purplish-brown wings, legs more or less yellowish, and the abdomen transversely marked with yellow, most prominent on the sides, and having an awl-like ovipositor which projects beyond the tip, is the female of the pigeon tremex (Tremex columba). The male is much smaller and darker and lacks the awl-like ovipositor. This insect is quite commonly distributed over the United States, and, therefore, is not out of its latitude in Wisconsin. It is relatively harmless, for while its larva feeds upon the wood and bores into the trunks of various trees, it is never so numerous as to do any material harm. It belongs to the order Hymenoptera and the family Uroceridae or horn-tails, and will be referred to under one of these various terms in any cyclopedia which may happen to mention it. The boys quoted were wrong in saying that they found these insects burrowing in holes in a lawn and covering the holes up before leaving them. They had in mind, without much doubt, one of the common large hornets (Stizus speciosus), which has somewhat similar coloring, but is a stouter and somewhat larger insect.

The female pigeon tremex bores with her ovipositor into the trunks of various trees that are already somewhat enfeebled. She may often be caught at this operation, and in fact sometimes gets so fast secured that she is unable to withdraw her ovipositor and perishes in the act of boring. She consigns an egg to the bottom of the perforation, and the larva that hatches therefrom bores into the trunk. The egg is rather elongate, pointed at each end, and about one-twentieth of an inch long. The larva has short thoracic legs, very strong gnawing jaws and a short anal thorn. It transforms to a naked pupa within the burrow, but is much pursued and preyed upon by the larva of our largest ichneumon flies, species of Thalessa, which, in the female sex, have immensely long and thread-like ovipositors, well calculated to probe and discover the burrows of the tremex larva.

Long Distance Telegraphing.

By the connection of several different lines telegraphic communication was established between Derby and Cape York, Australia, a distance by the wires of 7,246 miles. This is believed to be the longest telegraph line in the world. The rate of transmission was eleven words per minute. There were fourteen repeating stations.

The Bicycling Era.*

This is the era of the bicycle, and nearly all the able-bodied men and women, boys and girls in the country are giving thought to the advantages secured by this distance-reducing and time-saving machine.

Every person who can walk can ride a bicycle; this method of progression is open to all save the very aged and infirm and those disabled by accident or disease. Awhile ago we now and then heard a protest against riding because it was undignified and conspicuous. It merely seemed so because it was unusual. Several years ago a bishop denounced the practice by women as immodest and therefore immoral. An immodest woman on a bicycle would surely be immodest still, the wheel not having any power to save her, but an immodest woman would be immodest walking in the street or sitting in church, or wherever she might be. The bicycle has nothing whatever to do with modesty or immodesty, with morality or immorality; and when the pious bishop uttered his denunciation of the machine and its use, his intellect must have been befuddled by too much pondering on subjects too hard or too easy for him. But his dictum has not counted for much, for the bicycle is growing in popularity every day, and the manufacturers, one of whom at least is turning out 100 machines every day, have difficulty in filling the orders that are sent to them.

In 1887 A. H. Overman, who had for years been experimenting with bicycle construction, recognized that in a new type which he then began to build, and which he called the Victor, a bicycle had been invented which was not merely an implement of sport, but a factor in the civilization of the world. This is now known as the safety bicycle, and is the universal type. When this type was first introduced, the wheels had narrow steel tires, and the rider, when the way was rough, was jolted in a manner that was uncomfortable and exhausting. Rubber tires were introduced, and followed by the introduction of springs under the seat or saddle. These inventions were an improvement, but still the vibration continued, though in a less degree. Then the pneumatic tire was introduced, and when its construction had been so perfected that the user could have reasonable confidence in its lasting qualities, the bicycle problem may be said to have been solved.

To be sure, there has been a constant effort to secure lightness of construction, and this has been in a great measure achieved. Five or six years ago a light machine would weigh about 50 pounds; now a good machine for general use on the roads and streets will weigh only about 25 pounds. For racing purposes machines are made considerably lighter than this, but for work on the roads a machine of a less weight than 23 pounds is apt to be unsafe, and those who are about to go in for bicycling are advised most strongly against being influenced in their choice of a machine by this question of weight alone. A good bicycle is of as much importance to the wheelman as a good horse is to him who prefers horseback riding over other forms of exercise. A man with an unsatisfactory machine to start with is more likely than not to take prejudice against bicycling and give up permanently, much to his own injury, what is the most healthful and most exhilarating sport and method of progression yet given to man.

At present, as has been previously intimated, the bicycle is coming into very general use. Chiefly, no doubt, just now it is used as a means of sport and pleasant exercise. And it may be that these will long be its chief uses; but even now it serves other purposes. In the smaller cities, where there is not such continuous and crowded travel on the streets, the bicycle is used quite commonly to go to and from business. And in the country, where the roads are at all decent, it is used by laborers, artisans, and mechanics to go to and from their work. A man who has once experienced the joy to be had from this exercise is persuaded that it is something so good that all should know of it, and therefore does not count time thrown away when it is given to the conversion of others to his way of thinking. Now, horseback riders are not like this, nor skaters, nor walkers, nor rowing men. Indeed, the bicyclists are singular in this matter of wanting others to enjoy what they enjoy. The reason for this is plain. In no other form of exercise is there such a chance for good comradeship. From this comradeship grow a kindly expansiveness, a friendly enthusiasm, remarkable and pleasant to contemplate. There is no telling how much active moral force this expansive enthusiasm may in time generate.

In business the bicycle is already utilized to some extent, the telegraph messengers in some smaller cities and country towns being mounted on them, and also the letter carriers. The perfection of the bicycle and the extension of good roads will hasten the time when letters will be delivered free to country as well as to city houses. This is the case now in Great Britain, where there is a free delivery at every house in the kingdom every day. Nothing now retards such extension of the postal facilities in America, save the bad roads, which are sure to be very much improved in the near future. Shops in England and France now use the bicycle to deliver small parcels, and there has been invented a very ingenious three-wheeled delivery wagon propelled on the safety bicycle principle, which is in use in Europe and is sure to find favor here in America. With such a carriage as this, milk and bread could be quite inexpensively delivered without the cost of keeping a horse.

Horseback riding is out of the question for many who would be most benefited by it, on account of the expense, whereas the bicycle is within the reach of very nearly all who have any need for it. The medical men have recognized this favorable feature of bicycle riding, and at a recent meeting of the Academy of Medicine, in New York, they discussed its advantages and disadvantages in a most serious manner. They came to the unanimous conclusion that, as a general thing, it was most excellent for both men and women, and a suitable form of exercise in every case where horseback riding would be suitable. At the same time they recognized the fact that riders sometimes, through ambition or other less explicable form of silliness, overexert their strength and do themselves serious injury. The doctors also discussed what has come to be known as the "bicyclist's stoop." The racers stoop so as to present less surface to the wind when going at top speed, but an ordinary rider who sits in other than an erect position is simply making a monkey of himself for no reason whatever, and very likely is permanently injuring the erectness of his figure. For other than racing purposes the handles of a bicycle should be so adjusted that the erect position will be natural.

It has often been asserted that bicycle riding is very injurious to women; if that be so, these medical men at the meeting mentioned failed to say anything about it. I asked one of the most famous gynæcological surgeons in New York about this matter, and he said that as a general thing a woman could do nothing wiser than ride a bicycle in moderation. He frankly admitted that some women would be hurt by it, as they would be by any form of exercise, but he did not see that there were any peculiar dangers from bicycling to women on account of their structural peculiarities.

Now a word about the speed of bicycles. This table will show the record of a bicyclist compared with the best speed made by horses:

	¼ mile.	½ mile.	¾ mile.	1 mile.
Johnson (bicyclist)	0·21⅝	0·46½	1·11⅘	1·35⅖
Salvator (race horse)	0·23½	0·47¼	1·11½	1·35⅕
Flying Jib (pacer)	0·20½	0·59	1·28¼	1·58¼
Robert J. (pacer)	0·30⅖	1·00⅘	1·30¼	2·01¼
Alix (trotter)	0·30⅗	1·01¼	1·32¾	2·03¾

In distance racing, whether on the road or the track, the bicyle rider has greatly the advantage of the horse, and can beat that animal at any distance, the farther the distance the greater the advantage in favor of the bicyclist.

*John Gilmer Speed, in Lippincott's.

A New Theory of Sleep.

Since the discoveries made by Golgi, Cajal, Retzius, and others, of the peculiar anatomical characteristics of the nerve cells, a number of new theories regarding brain function and brain action have been in the field. The nerve cell, as it is now understood, consists of a very large number of long branched processes, which are called the protoplasmic processes, and a single axis cylinder which extends out, becoming eventually the nerve fiber and giving off fine lateral branches. It has also been shown that each nerve cell in the brain is in contiguity with some other nerve cell, or rather with the terminals of the axis cylinder process of that cell, but that no actual union takes place between the processes from the one cell and fiber process of the other. When one set of nerve cells, for example, are thrown into activity, impulses are sent out along the axis cylinders and their terminal end brushes, and these affect by contact the protoplasmic processes of other cells. Cajal and others look upon the axis cylinder and nerve fiber as conveying impulses out from the nerve cell or body, while the protoplasmic processes receive impulses brought to them and carry them to the cell body. These latter, therefore, are sometimes called cellulipetal, while the axis cylinder process is called cellulifugal. We are speaking, of course, now of the relations of the different groups of cells in different parts of the brain, rather than of the relations of these cells to the spinal cord and parts below. Some time ago Professor Duval proposed the theory of sleep based upon the peculiar relations of the brain cells and fibers. According to this theory, the nerve cells in repose retracted their processes, which, as he thought, were really pseudopods. The cell processes being thus retracted, the contiguity of the cell with other cells was less perfect; hence their functions became lowered, consciousness was lost, and sleep ensued. Kolliker objected to this view, on the ground that amœboid movements are never observed in nerve cells, at least of the higher animals; Duval having contended that he had seen such movements in the lower orders of animals. Cajal, siding with Kolliker, states that no matter what way you kill an animal—by shock, strangulation or anæsthesia—the nerve cells never differ in aspect, and one never can discover any amœboid movements among them, even when they are placed freshly in the field of the microscope. Cajal has, however, suggested another theory of sleep which he believes more rational and more in accordance with facts. While nerve cells do not have amœboid movements, there are, scattered richly throughout the brain tissues, other cells known as neuroglia cells. These are cells with very numerous fine processes, and they form in a large measure the supporting framework of the brain tissue, sending their fine processes in among the nerve cells and blood vessels. Now Cajal's theory is that these neuroglia cells during repose extend or relax their fine hair-like processes. As the result of this the perfect contact between the processes of the nerve cells and the end brushes from the axis cylinders that surround them is interfered with, hence the brain function is slowed up and sleep ensues. During activity these neuroglia cells retract their numberless fine processes, the contact between the nerve cells becomes perfect again, and mental functions are resumed. The practical facts upon which Cajal bases this ingenious theory are that the neuroglia cells are found to be in different states. In some their processes are retracted and shriveled and in others they are extended. There is unquestionably an amœboid movement, therefore, in this class of cells. Furthermore, it is in accordance, he says, with physiological facts that a cell would retract its processes during activity and relax them during repose. The physical basis of sleep, therefore, according to this view, would be the bristling up of the hair-like processes of the neuroglia cells, a squeezing of them in between the machinery by which the nerve impulses pass, and a sort of a clogging of the psychical mechanism.

Such theories are, of course, as yet only theories, and may be regarded by practical minds with great contempt. Still, there is sometimes an advantage in scientific hypotheses, even if they furnish only an intellectual exercise to the student.—Medical Record.

Railway Accidents in 1894.

(From the report of the Interstate Commerce Commission.) During the year, 1,823 railway employes were killed and 23,422 were injured, as compared with 2,727 killed and 31,729 injured in 1893. This marked decrease in casualty is in part due to the decrease in the number of men employed, and the decrease in the volume of business handled. The increased use of automatic appliances on railway equipment also may have rendered railway employment less dangerous, and it may be that the grade of efficiency of employes has been raised.

The number of passengers killed was 324, an increase of 25, and the number injured was 3,304, a decrease of 195. Of the total number of fatal casualties to railway employes, 251 were due to coupling and uncoupling cars, 439 to falling from trains and engines, 50 to overhead obstructions, 145 to collisions, 108 to derailments, and the balance to various other causes not easily classified. To show the ratio of casualty, it may be stated that 1 employe was killed out of every 428 in service and 1 injured out of every 33 employed. The trainmen perform the most dangerous service, 1 out of every 156 employed having been killed and 1 out of every 12 having been injured.

The ratio of casualty to passengers is in striking contrast to that of railway employes, 1 passenger having been killed out of each 1,912,618 carried, or for each 44,103,228 miles traveled, and 1 injured out of each 204,248 carried, or for each 4,709,771 miles traveled. A distribution of accidents to the territorial groups exhibits the diversity in the relative safety of railway employment and of railway travel in the different sections of the country.

Lightning and Barns.

Mr. McAdie's pamphlet on "Protection from Lightning" has been revised and republished. Among the additions made to the old material is a discussion of the question whether barns are any more liable to be struck by lightning after being filled than before. Mr. McAdie cites these figures; Last year, prior to August 1, 223 persons were reported as killed by lightning in this country; after that date, 113; dwellings struck, before August 1, 173; after, 87; churches, before, 10; after, 15; barns, before, 130; after, 138. It thus appears that while much more than half the year's damage done by lightning in other directions occurred prior to the date mentioned, a trifle more than half the injury to barns from that cause came afterward. Mr. McAdie mentions three possible reasons for this increased peril after harvesting the crops: (1) The stalks of grass and growing grain serve as tiny lightning rods, and relieve the electric strain between sky and earth, but when they have been cut down only the buildings and trees are left to serve that purpose; (2) a full barn is warmer, and hence more readily ignited than an empty one; and (3) the vapor in the warm air, rising from a barn filled with new hay, attracts the electric current and invites a discharge by that route.

RECENTLY PATENTED INVENTIONS.

Engineering.

STEAM BOILER.—Jose D. De Benjumea, New York City. According to this invention a cylindrical shell has a fire chamber in its base, and two cylindrical shells of different diameters within and concentric with the outer shell. A spiral partition in the innermost shell forms an uptake for hot gases from the fire chamber, and there are sealing rings between the ends of the two inner shells forming a water-holding space in which is a spiral partition, there being also a spiral partition between the larger of the inner shells and the outer shell, forming a down-take passage for the products of combustion, there being a draught pipe at the lower end of the passage. On the top of the outer shell is a deflecting crown sheet and a steam dome.

LOCOMOTIVE SNOW OR ICE FLANGER.—Augustus F. Priest, Duluth, Minn. This flanger is an improvement on formerly patented inventions, and is arranged to permit the engineer in the cab to readily raise or lower the flanger blades and hold the knives in proper position relative to the rails. The flanger readily conforms to all irregular surfaces in the track, whether vertical or lateral, and gives an even depth of cut, the knives in no case touching the rails, but being perfectly locked and braced to clean the rails for every wheel in the train. By arranging the device directly behind the pilot, it is entirely out of the way and not liable to accidental injury by an obstruction.

BOILER FUEL FEED.—Adelbert O. Muller, Fremont, Neb. This is an apparatus comprising a supporting frame directly in front of the firing door, a fuel-carrying box fitted to slide on the frame, and pivoted bottom sections having pinions on their trunnions exteriorly of the box, there being a connection between the pinions to cause them to move in unison. To clean the fire box, the whole apparatus may be hoisted and swung away. The improvement is designed to facilitate the introduction of fuel in a very simple manner, distributing it uniformly in the fire box.

Railway Appliances.

AIR BRAKE COUPLING.—William A. and Benjamin S. H. Harris, Greenville, S. C. Combined with the coupling heads and their valves, according to this improvement, is a shifting regulating device set or adjusted by the movement of the train and operating to limit the movement of the valve-controlling devices variably under different conditions, so that in case a train is broken the valves of the detached car will be adjusted to set the brakes and the valves of the engine portion of the train will be adjusted to cause the engineer's whistle to blow. Locking devices are also provided to lock the couplings brought together. The coupling carrier is composed of sections or slides movable one upon the other, such movement operating to actuate certain movable parts.

Electrical.

ELECTRIC RAILWAY.—Francis Taylor, Charlotte, N. C. This invention relates to an underground system, and particularly to the arrangement of the brush or current transmitter and the conduit and current wire holding devices. The conduit may be readily applied to existing roadbeds where the rails rest on wooden crossties, and when in place can be easily repaired. The current transmitter has a supporting shank capable of being rotated and lifted vertically by the motorman on the car platform, the brush member being reversed or brought in line with the conduit slot, and lifted out of the slot when desired.

Mechanical.

PLANING MILL MACHINERY.—Charles Schoen, Rhinelander, Wis. This inventor provides a device for setting up matchers for planing mill machinery, whereby the beader knives may be quickly and conveniently adjusted to perform their work. By the aid of the device any ordinary mill hand may set up a matcher for any predetermined style of moulding in a very short time. The device may be fitted to any four-sided slotted matcher cylinder top or bottom. The device is detached from the machine when the latter is in motion, but may in an instant be placed in position to properly adjust the knives, and removed.

EDGER.—John Cox, Victoria, Canada. For properly cutting parallel edges on shingles, boards, etc., this invention provides shifting devices actuated by the forwardly moving article to be edged to set the saws transversely on their spindle according to the width of the article. The articles are carried forward by an endless feed belt, and a locking device actuated by the moving article prevents outward movement of the edging tools and yet allows inward movement.

Agricultural.

CULTIVATOR.—Thomas J. Payne, Tecumseh, Oklahoma Ter. This is an implement especially adapted for the cultivation of listed corn, and has runners so formed and located that they will fit closely in a furrow, the runners having teeth capable of effectively pulverizing the soil. There are knives at the rear of the cultivator to cut off the outward edges of the furrow, or that portion where the weeds usually start first to grow. The construction is simple and inexpensive and the machine is light of draught.

PLANTER.—Lewis F. Miller, Canton, N. C. This is a very simple machine, requiring no castings, and the parts of which may be easily duplicated by any mechanic. It is designed to open the furrow, drop the seed and a portion of fertilizer if desired, and cover the seed. In the seed wheel the pockets may be made large or small, as required by the work, the adjustment being effected in an easy and convenient manner.

Miscellaneous.

CYLINDER PRINTING PRESS.—William M. Marriner and William N. Kant, Birmingham, Ala. This is a press adapted to be run by foot power, is designed to be quite inexpensive, and to be especially suited for use in small newspaper offices. The type bed is on a stationary slightly inclined frame to which is hinged a swinging frame on which an impression cylinder rolls back and forth, trailing inking rollers being connected with the shaft of the cylinder. When the paper is fed the cylinder frame is permitted to drop and the cylinder rolls down across the bed, the printed sheet being dropped on a delivery board. By the operator stepping on the treadle the free end of the frame is lifted, shifting the incline and causing the cylinder to roll back. The press is operated, when once started, by simply stepping on the treadle, the inking being automatically performed.

BICYCLE DRIVING MECHANISM.—S. J. Collier, deceased (P. B. Turpin, Washington, D. C., administrator). This is a two-speed mechanism, enabling the wheel to be conveniently geared for speed or geared down for power while the machine is running. The crank axle, on which is a spur pinion, is mounted eccentrically in a larger axle, and a combined chain sprocket wheel and internal toothed wheel is mounted concentrically upon the larger axle and in gear with the pinion on the crank axle, there being means for locking the two axles together and for temporarily unlocking them and at the same time locking the large axle to the frame.

PICKING MACHINE.—Sylvenus D. Mosher, Storm King, N. Y. This invention provides a simple apparatus which may be applied to a traction engine or other vehicle to pick up the surface of the ground so that the loosened material may be raised by a steam or other shovel, the machine picking on the surface or in the bottom of a ditch. The machine comprises a swinging frame at the outer and inner ends of which are crank shafts with which series of picks are operatively connected.

ICE CUTTING MACHINE.—Martin Fey, Tamaqua, Pa. This improvement relates particularly to means for guiding the machine and for cutting ice blocks of different widths. A dependent frame is arranged alongside the cutter, vertical guide posts being laterally adjustable toward and from the cutter in the frame, and a horizontal bar sliding vertically on the posts, while aligned guides attached to and pendent from the bar are adapted to run in a cut or kerf in the ice. The guides may be raised and held above the surface of the ice or lowered to a greater or less depth in the kerf.

WORK STAND.—Clinton E. Lincoln, Morehead City, N. C. This stand embodies a cabinet for scissors, buttons, thimbles, etc., with a number of drawers, serving also as a table, and having a thread rack on which spools may be held under proper tension for the unwinding of the thread without tangling, the support for each spool being provided with a thread cutter. The stand is also provided with a removable work basket, which may be revolved.

MEAT TENDERER.—William G. Mumma, Warrensburg, Mo. This is a simple and inexpensive tool having a handled head with grooves in its margin, depending cutters being secured on the under side of the head. To prevent the clinging of the meat to the cutters, spring wires cross each other beneath the head, the wires engaging the grooves and having their ends secured to the head.

GRATE.—Samuel L. Jeter, Montgomery, Ala. This grate is more especially designed for use in open fireplaces, permitting the quick and thorough removal of the ashes to insure improved combustion. Journaled in the grate frame is a basket of grate bars each having at its outer end a crank arm extending upward in front of the basket, there being a lever and connecting rod for the crank arms to shake the grate bars.

LUBRICATOR.—Charles P. Hogue and Joseph W. Smith, Portland, Oregon. This is a device designed to forcibly feed the desired amount of lubricant to a bearing and consists principally of a piston in an oil-containing vessel to force the lubricant out. The device is adapted to conveniently feed a large quantity of the lubricant by hand to the part to be lubricated when desired, and the lubricator reservoir is readily refilled.

BOOK SUPPORT.—Charles H. Hay, Carmi, Ill. This device comprises a frame formed at its middle with trunnions journaled in suitable bearings attached to a desk or other convenient support. The frame is counterbalanced, and shelves are held on its free ends, a spring-pressed locking device locking the frame in any desired position, the device being more especially designed for supporting large books, such as court records, abstracts, ledgers, etc., in such manner that the open book has the top leaves at a level.

WINDOW.—John B. Grattarola, New York City. This invention provides a simple mechanism to permit of readily sliding the sashes up and down and to swing them inward to give access to both faces to facilitate cleaning them. The sash is pivoted at one side on a sliding bar or guide piece, and adapted to be locked at its other side to a removable part of the sash guideway.

POCKET GUARD.—Patrick Curran, Romeo, Ill. This is a device for securing a pocket book, watch, or similar article in a pocket, the article being readily removed when desired, but so secured that it must be pressed downward when taken, thus giving notice to the wearer. It consists of a strip of metal bent upon itself to form opposing members, one member having lugs engaged by pins, and both members having interlocking tongues. The watch or other article is attached to the device, and the pins engage the pocket.

INDICATOR FOR PIANO STOOLS.—Carlo Brizzi, New York City. This is a device to indicate whether or not the stool is at the proper height for the player. From the lower end of the threaded spindle supporting the seat extends a square rod on which is a pinion held in a suitable bracket support, and the pinion is in mesh with gear teeth on a dial, placed horizontally or diagonally to be most conveniently seen by the player, the dial being marked with graduations, and being turned by the pinion as the seat is moved up or down, its position being at all times indicated by a pointer.

LOOM PILE WIRE HOLDER AND CUTTER.—Victor Vizet, New Rochelle, N. Y. According to this improvement the cutter is made in one piece with the sheath to receive the end of the wire, whereby the pile wire holder is made much stronger than heretofore, and the article is simpler to manufacture.

MAKING CHLORINE.—James J. Powers, Cortlandt, N. Y. This inventor has devised an apparatus for making chlorine gas and similar substances, in which a substance has to be treated by an acid, and in which the acid is measured to secure proper proportion of weights and volumes, a safety appliance being provided to prevent explosion. An open top measuring tank is connected by a pipe with a storage tank into which air may be forced to push out the acid, which a pressure tank receives as it is discharged by gravity from the measuring tank, a generating still being connected by a pipe with the pressure tank.

DENTAL CLAMP.—Joseph M. Strout, Portland, Me. This is an improvement upon a formerly patented invention of the same inventor, designed to afford a practically perfect adaptability of the retaining arm of the device to irregular surfaces of teeth, and secure any desired tension upon the arm. Means are also provided whereby the gum at the neck of the tooth will be protected while the root is being trimmed preparatory to applying a crown.

ATOMIZER.—Charles Wagner, New York City. This device consists principally of a cylinder in which is a valved suction pipe, a spring-pressed piston, the piston rod forming the discharge pipe for the liquid. The atomizer may also be arranged for use as an oiler or as pump, or for the purpose of ejecting any desired liquid.

FILTERING POT OR URN.—William A. Van Deusen, Brooklyn, N. Y. This invention affords improved means of preparing coffee, tea or other decoctions. In the top of the pot is a strainer bowl and beneath it is a drip bowl, a paper filter being arranged loosely between them, water being poured on the contents of the strainer bowl for ordinary filtering. When the liquid is to be boiled, the pot has a removable false bottom forming a steam chamber from which a tube communicates with the strainer bowl in such a way that the hot water will be forced up through the tube and percolated over the contents of the strainer bowl.

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Notes & Queries

HINTS TO CORRESPONDENTS.

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References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.
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Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(6603) H. J. M. says: Can you tell me the proper process of making nitrate of silver? A. To make nitrate of silver out of pure silver, place the silver in a beaker and pour into it three-quarters of a fluid ounce of strong nitric acid sp. gr. 1·4 for every ounce of metal. The beaker is heated till the whole of the silver dissolves. The solution is then poured into an evaporating basin, and the excess of acid driven off by boiling. The operations should be conducted in the open air. The salts left may be recrystallized by dissolving in the the smallest possible quantity of boiling water and allowing it to cool. The crystals of pure nitrate of silver will gradually form. The salt remaining in the mother liquor can be recovered by evaporation. To prepare chloride of gold, the copper in the coin must first be elimnated. The gold coin is put into a beaker, and a mixture of three parts of hydrochloric acid and one of nitric acid is poured into it and heat applied until the metal is dissolved. The excess of acid is then expelled by evaporation. The impure gold chloride, when free from acid, is dissolved in boiling water, and a cold saturated solution of protosulphate of iron added, till a dark precipitate of pure gold is no longer produced. The precipitate of gold must be poured on a filter and washed by pouring boiling water constantly over it, till the wash water no longer produces a precipitate with a solution of barium chloride, proving that the gold is free from the excess of sulphate of iron. The gold is again dissolved in nitrohydrochloric acid, the solution evaporated to dryness, the latter part of the operation being carried on slowly to prevent spurting. The yellow crystalline chloride of gold thus prepared should be preserved in a well stoppered bottle or a sealed tube, as the salt is very deliquescent.

(6604) X. Y. asks: Will you please define and illustrate by an example the difference between momentum and vis viva? Which of the two represents the force with which one body strikes another? A. Momentum is the weight of a body multiplied by its velocity usually in feet per second, and denominated in foot pounds. Vis viva is a term used by early writers to designate the force of the momentum of a body in terms of its work and now designated as energy. It is now obsolete as a mechanical expression.

(6605) C. B. says: Please tell me how to make the composition for printer's rollers?

A.

Best glue	10½ lb.
Black molasses or honey	2½ gal.
India rubber dissolved in oil of turpentine	1 lb.
Venice turpentine	2 oz.
Glycerine	12 oz.
Vinegar	4 oz.

Purified India rubber only is used. To recast add 20 per cent new material. The old home receipt is, 2 lb. best glue, soaked over night, to 1 gal. of New Orleans molasses. Will not recast.

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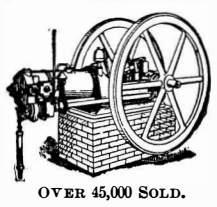

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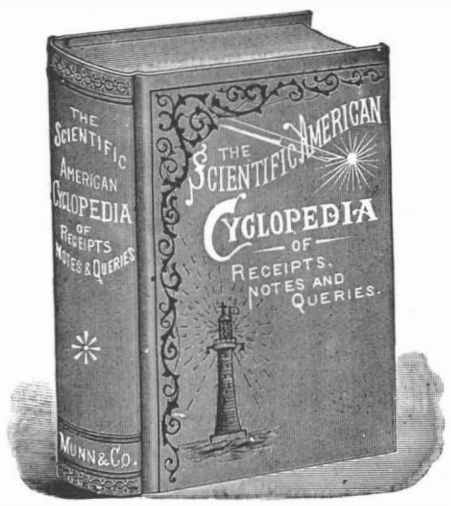

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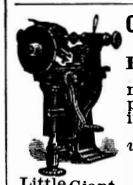

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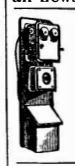

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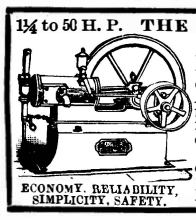

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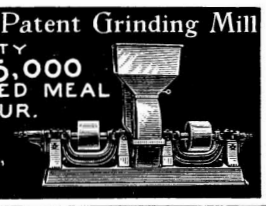

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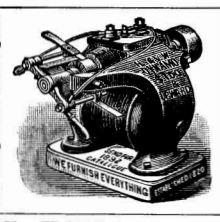

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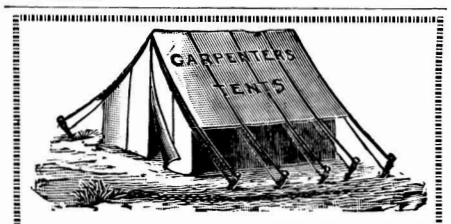

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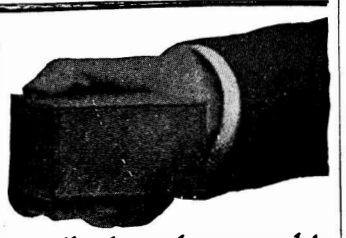

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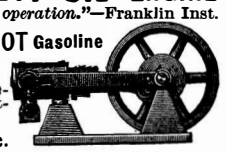

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